Museum Victoria
71379

Royal
Society
of
Tasmania

Papers
&
Proceedings

1945-46

National Museum
of
Victoria

PAPERS AND PROCEEDINGS

OF

THE ROYAL SOCIETY OF TASMANIA

FOR THE YEAR

1945

NATIONAL MUSEUM
13 JAN 1947
VICTORIA.

Edited by

JOSEPH PEARSON

and

D. COLBRON PEARSE

PUBLISHED BY THE SOCIETY

The Tasmanian Museum and Art Gallery, Hobart

1.10.46

Price: Ten Shillings

NATIONAL MUSEUM OF VICTORIA

The Royal Society of Tasmania

Papers and Proceedings, 1945

CONTENTS

	Page
Nutrition Problems in Tasmania. By F. W. Clements	1
The Affinities of the Rat-kangaroos (Marsupialia) as revealed by a comparative study of the Female Urogenital System. By J. Pearson	13
Notes on the Tasmanian Marine Crayfish *Jasus lalandii* Milne Edwards. By V. V. Hickman	27
A Description of *Sterrhurus macrorchis* n.sp., with Notes on the Taxonomy of the Genus *Sterrhurus* Looss (Trematoda-Hemiuridae). By P. W. Crowcroft	39
Notes on the Lepidoptera-Rhopalocera of Tasmania. By L. E. Couchman	49
A Summary of the Tasmanian Phreatoicids: A Contribution to the Biological Survey of Tasmania. By G. E. Nicholls	55
Ecology of the Fresh-water Fauna of Lake St. Clair, particularly the Copepoda, with special reference to Diurnal and Seasonal Variations in Conditions. By A. W. G. Powell	63
Note on Cottage Green. By W. H. Hudspeth	129
Author Index of Papers of Roy. Soc. Tas.	141
Annual Report, 1945	157
Abstract of Proceedings	162
List of Members, 1945	169

Nutrition Problems in Tasmania

BY

F. W. Clements

(Read 13th November, 1945)

Plate I

NATIONAL MUSEUM OF VICTORIA

The nutritional status of a population may be measured in a number of ways:

I. By a study of health as revealed by—

(i) Mortality statistics

(ii) Morbidity statistics

(iii) A nutritional survey of the whole population, of special sections or of groups chosen at random.

Such a survey can be either clinical, or clinical combined with laboratory tests.

Mortality and morbidity statistics as a rule reveal only gross or advanced changes, whereas a nutritional survey can be used to detect minor departures from normal health produced by inadequate consumption of the right kind of foods:

II. By a study of the total food supplies available to the population as a whole:

III. By a study of the food consumed by groups of households selected, either according to a definite plan or in a random manner.

Methods II. and III. have a limited value and must be used with considerable caution. In both methods the average per capita consumption of food by the whole population, by sections of it, or by individual households is measured against some pre-selected standard. The only valid conclusion that can be drawn from these data is that the level of food consumption did or did not reach the standard. A common error in the interpretation of results of this nature is to assume that, because the consumption of one or more nutrients was below the selected standard, the population or sections of it was suffering from malnutrition. The most that can be claimed for these methods is that they provide an indication of possible deficiencies and suggest the directions in which special inquiries should be made.

The most satisfactory way to assess the nutritional status of a population is to combine, as far as possible, all three methods.

Nutritional Status of the Population of Tasmania

As far as I have been able to ascertain, prior to 1944 no attempts were made to study the food composition pattern of the people of Tasmania or to carry out a scientific investigation into the nutritional status of the population. In 1944 a domestic food consumption survey was undertaken in Hobart, Launceston, New

Norfolk, Queenstown, Burnie and Latrobe, and some 204 households were investigated in all during the months of October, November and December.

This survey was part of an Australian-wide investigation undertaken to determine whether wartime conditions had altered the food consumption pattern in Australia and whether there was any evidence of inadequate food consumption by any section of the population. The details of the methods used to collect the information and analyse the material statistically are set out in the report of the survey (1).

The records of the food purchased by each household were treated in such a way that the average per capita consumption of each foodstuff for each household was obtained, and from this the average per capita intake of the principal nutrients, that is, protein, fat, carbohydrate, calcium, iron, vitamin A, thiamin and vitamin C were calculated. These figures could then be combined to obtain the average per capita intake for Australia, for a State, or for a section of a State.

In order to assess the value of the average per capita consumption it was necessary to compare the data with a standard level of food intake which had been accepted as one which, in normal people, would ensure full health. A fully satisfactory standard has not yet been devised, but in 1941 the Food and Nutrition Board of the National Research Council of America drew up a table of recommended allowances (2) which has received support throughout the world as the most satisfactory available. This table has, however, been criticised by some authorities who maintain that the levels of intake recommended for some of the minerals and vitamins are unduly high. A special committee of British, American, and Canadian scientists, appointed by the Combined Food Board to compare the levels of civilian food consumption in the three countries, used a modification of this National Research Council table, which was termed the N.R.C. (restricted) Table of Recommended Allowances (3). This modified table was made up of the original N.R.C. figures for calories and protein in all cases, and for minerals and vitamins in respect of groups up to the age of 20 years and expectant and nursing mothers. Elsewhere they are 70 per cent of N.R.C. allowances for minerals and vitamins for adult men and adult women. By using this table it is possible to calculate what the mean daily intake per capita of each nutrient should be. The figure so obtained is the ' weighted average recommended intake '.

Table 1 shows the comparison between the mean daily intake of nutrients per capita for the metropolitan (Hobart and Launceston) and the country districts of Tasmania with those for Australia as a whole. The weighted average recommended intake per capita is shown in brackets.

It will be observed that the mean daily intake of nutrients in both Tasmania and Australia as a whole was above the requirements, with the exception of calcium. Although the intake of vitamin C was above the requirements, the figures call for special comment. The consumption figures do not take into account the losses of vitamin C due to the transport, storage and cookery of food, and many investigators have demonstrated that these losses can be considerable. Because of this, absolute figures for vitamin C intake, or for that matter of any of the vitamins, are of limited value.

However, figures of this nature are useful for comparison, and in this regard it will be seen from Table 1 that the mean daily intake of calcium and vitamin C in Tasmania is appreciably lower than that of Australia as a whole. This was one of the most important facts revealed by the survey. It does not, of itself, mean that the population or any section of it is suffering from deficiency diseases due to a shortage of calcium or vitamin C, but the data do suggest the lines along which detailed inquiries, particularly clinical or laboratory investigations, should be made.

Since the results of the 1944 food consumption survey became available a number of further investigations have been initiated—

(1) I have made a critical examination of the information relating to the supply in Tasmania of those foodstuffs which normally supply calcium and vitamin C to the diet.

(2) Steps have been taken to carry out another domestic food consumption survey in Tasmania, as a check.

(3) Clinical and laboratory examinations have been made of sections of the population of Tasmania.

TABLE 1

Mean Daily Intake of Nutrients, Per Capita Comparison between Tasmania and All Australia

(The weighted average recommended intake per capita shown in brackets)

Nutrient	Tasmania				All Australia	
	Metropolitan		Country			
Protein grms.	85	(61)	83	(58)	82	(59)
Fat grms.	90	—	88	—	93	—
Carbohydrate grms.	362	—	356	—	341	—
Calories	2663	(2294)	2619	(2184)	2597	(2234)
Calcium mgms.	618	(811)	625	(838)	714	(816)
Iron mgms.	14·4	(9·2)	13·9	(9·0)	13·9	(9·0)
Vitamin A I.U.	3780	(3380)	3660	(3261)	3890	(3036)
Vitamin B1 mcgms.	1117	(1063)	1101	(1022)	1078	(1037)
Vitamin C mgms.	79	(54)	86	(53)	97	(53)

The additional data collected in these investigations is presented in this paper.

SOURCES OF CALCIUM IN THE TASMANIAN DIET

The amount of calcium contributed by each food group to the total daily intake in the average Australian diet is shown in Table 2—

TABLE 2

Contribution of Calcium made by Each Food Group in the Australian Diet

Commodity	Average Daily Intake of Calcium mgm.	Percentage contributed by Food Group
Dairy products	540	73·2
Grains—cereals	50	6·8
Leafy, green, and yellow vegetables	30	4·1
Meats	22	3·0
Eggs	21	2·8
Other vegetables	20	2·7
Fruit (other than citrus)	16	2·2
Potatoes	12	1·6
Tomatoes and citrus	10	1·4
Miscellaneous sources	17	2·2
Total	738	100·0

The figures in this table were obtained by the analysis of 'source data', i.e., of the records of all food supplies moving into civilian consumption in the year 1944. This explains the difference between these figures and those shown in Table 1.

From Table 2 it is apparent that dairy products constitute the major source of calcium in the Australian dietary. Closer examination of the dairy products group shows that 80 per cent of the calcium supplied by these items is obtained from fresh liquid milk, with the remainder supplied by processed milks and cheese. Thus it seems that the problem of calcium intake in Tasmania resolves itself into an investigation of the consumption of liquid milk.

Milk Consumption in Tasmania.

The 1944 food consumption survey showed the following levels of liquid milk consumption in the various States of Australia—

Table 3

Levels of Milk Consumption in Various States

	Liquid Milk Consumption. Pints Per Head Per Week.
All Australia	4·4
New South Wales:	
Metropolitan	4·8
Country	3·9
Victoria:	
Metropolitan	5·4
Country	5·2
Queensland:	
Metropolitan	4·7
Country	3·9
South Australia:	
Metropolitan	5·0
Country	5·1
Western Australia:	
Metropolitan	3·8
Country	3·4
Tasmania:	
Metropolitan	3·5
Country	3·2

Another source of information is available. Figures collected by the Commonwealth Statistician and the various State Government Statisticians show the estimated quantity of milk available to the civilian population in the various States. The all-Australian figure is 27¾ gallons per head per year, whilst the Tasmanian figure is in the vicinity of 23 gallons per head per year. These figures agree very closely with those collected in the survey, as the following comparison indicates—

	All Australian	Tasmania
Source data (from Statisticians)	27·9	23·72
Survey	28·6	22·75

Still further information on the consumption in specialized types of households is available. It is agreed by nutrition authorities that expectant and nursing mothers should drink about 1½ pints of milk a day. A number of households covered by the 1944 survey contained an expectant or nursing mother, and we investigated the relationship of the calcium intake in these families to the amount that should have been consumed if the full requirements of all members of the household were satisfied. The results are shown in Table 4.

TABLE 4.

Relationship of Calcium Intake to Requirements in Households containing a Pregnant or Nursing Woman

Relationship of Calcium Intake to Requirements	Percentage of Households Containing Pregnant Woman		Percentage of Households Containing Nursing Woman	
	Tasmania	Remainder of Australia	Tasmania	Remainder of Australia
Adequate	Nil	15·8	7	10·3
1-10% deficient	Nil	10·5	Nil	8·9
11-20% deficient	Nil	7·0	7	15·2
21-30% deficient	21·4	17·5	7	18·6
31-40% deficient	14·3	16·7	28	15·8
41-50% deficient	14·3	17·5	42	15·2
51-60% deficient	50·0	10·5	7	11·0
61-70% deficient	Nil	2·6	Nil	3·4
71-80% deficient	Nil	1·7	Nil	1·3

Table 4 shows a high percentage of households containing an expectant or nursing woman in which the intake of calcium was well below requirements. The picture for Tasmania is that of an even lower level of intake in these households than for similar ones in the remainder of Australia.

The Commonwealth Production Bulletin shows that for the year 1943-44 the milk production per cow in Victoria was 575 gallons per year, whilst in Tasmania it was in the vicinity of 421 gallons. This is not, in my opinion, a casual factor in the lower milk consumption in the island State, for surely milk is a commodity for which, in general, the supply meets the demand.

The conclusion to be drawn is that the demand for milk in Tasmania is considerably less than it is in, say, the Victorian metropolitan area, where the consumption per head per week is nearly 50 per cent higher than it is in Hobart and Launceston.

Information which will fully explain the lower demand for milk in Tasmania is not available, but a lack of awareness on the part of the public of the value of milk in the diet of at least some sections of the community must be one factor.

Sources of Vitamin C in the Tasmanian Diet

The contribution of vitamin C made by each food group to the total daily intake in the average Australian diet is shown in Table 5.

Table 5

Contribution of Vitamin C made by Each Food Group in the Australian Diet

Commodity	Average Daily Intake of Vitamin C mgm.	Percentage Contribution by Food Group
Potatoes	26·7	30·1
Leafy, green, and yellow vegetables	22·6	25·5
Tomatoes and citrus fruits	15·9	17·9
Other vegetables	9·3	10·4
Other fruit	8·6	9·7
Dairy products	5·7	6·4
Total	88·7	100·0

The figures in this table were obtained by the analysis of source data, i.e., of the records of all food supplies moving into civilian consumption in the year 1944. This explains the difference between these figures and those shown in Table 1.

The supply of the foods that contribute vitamin C to the diet is subject to considerable seasonal variation. Furthermore, whilst milk is the principal source of calcium for persons of all ages and both sexes, the foods that supply vitamin C, in general, vary according to the age of the individual. Potatoes and green leafy vegetables are the principal source of vitamin C for normal adults, whilst more concentrated sources, as for example, citrus fruits, berry fruits and tomatoes, are usually used to supply the bulk of the vitamin C requirement of infants, children, pregnant and lactating women. Thus the supply of vitamin C is not a single problem as in the provision of calcium, of which milk is the principal source.

From official sources it is possible to obtain the annual production of the principal fruits and vegetables in Tasmania, but impossible to secure data of the civilian consumption, especially month by month. However, the records of the 1944 Food Consumption Survey give an indication of the consumption pattern in each of the States, and these were used to trace the factors responsible for the lower intake of vitamin C in Tasmania. A comparison was drawn between the consumption of fruit and vegetables in Tasmania, Adelaide and Perth, as revealed by the records of the households covered by the survey. This procedure is valid, as these three areas were investigated at the same season of the year. The smallness of Tasmania, which should help to equalise distribution throughout the State, justifies comparison with a capital city. The relevant data are shown in Table 6.

TABLE 6

Mean Weekly Per Capita Consumption of Fruit and Vegetables in Households covered by the Survey in Tasmania, Adelaide and Perth

Variety of Fruit or Vegetable	Mean Weekly Consumption (in lbs.) Per Head		
	Tasmania	Adelaide	Perth
Potatoes	3·02	2·26	1·98
Carrots	0·25 } 0·71	0·25 } 0·58	0·26 } 0·77
Other root vegetables	0·46	0·33	0·51
Cabbages	0·45	0·52	0·51
Sprouts, cauliflower, broccoli	0·17 } 1·09	0·20 } 1·08	0·07 } 1·07
Spinach	0·13	0·18	0·18
Lettuce and endive	0·34	0·18	0·31
Fresh beans and peas	0·31	0·67	0·54
Fresh tomatoes	0·06	0·19	0·51
Citrus fruit	0·26	0·89	0·72
Other fresh fruit	0·97	1·58	1·43

The outstanding features of Table 6 are:

(*a*) The high consumption of potatoes in Tasmania;
(*b*) The remarkable degree of uniformity in the mean weekly consumption of 'green' vegetables;
(*c*) The low consumption of tomatoes in Tasmania;
(*d*) The low consumption of citrus fruits;
(*e*) The lower consumption of 'other fruit' in Tasmania.

At this stage it will be profitable to consider, briefly, the fruit and vegetable production pattern in Tasmania:

(1) Potatoes are produced in abundance and there is a considerable surplus available for export. This explains, in part at least, the high consumption level in this island State. I understand that harvesting continues throughout most of the year with the trough, if any, in October.

(2) Very few data are available on the production of 'green' vegetables at different seasons of the year in Tasmania. The Government Statistician can supply the annual production figures, but it is impossible to determine from these the amount available for civilian consumption in any one month. However, from the figures in Table 6 it is apparent that the consumption, and so, presumably, the production of green vegetables in Tasmania in October, November and December, 1944, was very similar to the consumption and, presumably, the production in the other two States.

(3) The season for tomatoes is, because of climatic factors, later in Tasmania than on the mainland. The high figures for consumption in Perth no doubt reflect the effect of the winter production around Geraldton.

(4) Practically no oranges are grown in Tasmania and almost all requirements are shipped from either Victoria, South Australia, New South Wales or Queensland. The peak production of citrus in the former two States is from August to October and, as Victoria does not produce sufficient citrus for its own requirements, it means that the amounts deflected to Tasmania are deliberate allocations by the growers' associations.

(5) Tasmania has a large proportion of berry fruits, some of which, particularly black currants, are rich in vitamin C. However, the berry fruits are harvested from February to April, with the peak, I understand, in March. Figures for the civilian consumption of fresh berry fruits are not available. Two important features must be taken into account when considering the contribution made by this type of fruit to the total vitamin C intake—

(a) The consumption of fresh fruit will be limited to the short harvest season;

(b) Because the fruit will not carry well, consumption in country districts may tend to be higher than in metropolitan areas.

The foregoing information does throw light upon the main features of the production of fruit and vegetables in Tasmania. More detailed information was required and an attempt was made to trace the seasonal variation in supplies.

In 1938 a domestic food consumption survey (4) was conducted in the capital cities of the mainland. That survey differed from the 1944 one in that it extended over 12 months. Miss Honey (5) has re-analysed the information collected in that survey in order to study the seasonal fluctuations in the supply of vitamin C in the households surveyed in Brisbane, Sydney, Melbourne and Adelaide. This work will shortly be published, and I have reproduced here the record for Adelaide (Plate I, fig. 1). It demonstrates that in that city the trough in intake of vitamin C occurred in the Autumn. This picture was of a typical pre-war year and is similar to that found in the four cities investigated. The problem of this trough has been discussed by Honey, and the solutions for it are the concern of the respective States.

Unfortunately, similar information extending over 12 months is not available for Tasmania. However, from data from a variety of sources I have constructed a graph to show, as far as is possible, the seasonal variation in the supply of vitamin C in this State (Plate I, fig. 2). Information relating to the seasonal production of fruits and vegetables was obtained from the agricultural authorities, whilst the figures for the importation of oranges into Tasmania were supplied by Mr. Kitchen Kerr of the Federal Citrus Council of Australia. Wherever possible, I have used the records of the 1944 food survey as a guide to the levels of consumption. Information was not, however, available for the civilian consumption of berry fruits. For these several reasons, the absolute values for the levels of vitamin C available are of limited value, but the graph does indicate the trend of supplies of vitamin C throughout the year.

Fig. 2 shows that in Tasmania, in contrast to southern mainland cities, the trough of vitamin C supplies occurs in the spring. This is the picture in the northern European countries and in England. The relatively severe Tasmanian winter reduces production of vegetables at this time, and retards the planting and harvesting of 'summer' vegetables and fruits. Of course, the only non-tropical fruits harvested at this time of the year are the citrus fruits.

In the mainland cities a spring trough in the supply of foods rich in vitamin C is avoided by the earlier maturation of the salad vegetables, and of potatoes, and, of course, a higher consumption of citrus fruits. Queensland presents a different picture, for there the tropical fruits, especially pawpaw, provide large amounts of vitamin C in the spring and summer (5).

With reference to orange supplies, the Tasmanian consumer does not fare as well as those on the mainland as the data in Table 7 reveals.

TABLE 7.

Comparison of Consumption of Oranges.

State	Bushel Cases Per Head Per Year
Queensland and New South Wales ..	0·53
Victoria	0·63
South Australia	0·52
Tasmania	0·33

(Information furnished by courtesy of Mr. Kitchen Kerr of the Federal Citrus Council of Australia.)

In fig. 2 I have added at the top of each column a hatched area to indicate the amount of additional ascorbic acid that would be available in Tasmania if the per capita consumption of oranges there was the same as in Victoria.

The information revealed by an examination of the supply and distribution of foods rich in vitamin C can be summarised as follows:

The high potato consumption throughout the year ensures a reasonable supply of vitamin C for the adult population, and not insignificant amounts for other sections. The apple and berry crops in the late summer, autumn and early winter contribute considerable amounts for all sections, so that at this time of the year the supply is almost certainly adequate for the majority of the population. This means that, providing distribution were equalised, the intake would be adequate. During spring and early summer the intake of vitamin C by infants and children and, perhaps, pregnant and lactating women may be below the requirements owing to insufficient supply, and therefore consumption of foods rich in the vitamin.

Repetition of the Domestic Food Survey

The comparatively small number of households covered in the 1944 survey raised doubts as to whether they were sufficiently representative of the population as a whole. For this and several other reasons the domestic food survey has been repeated. The results available to date are very similar to those obtained last year. Where the figures are significantly different the change is, with the exception of potatoes, in the direction of less satisfactory consumption than those revealed last year. The average per capita consumption of potatoes is considerably higher than for the same period last year.

The Clinical Survey

During October, in conjunction with Dr George of the State Health Department, I examined several hundred children attending a number of schools in southern Tasmania. In these examinations we looked for clinical evidence of deficiency states, paying particular attention to even minor departures from normal health. Whilst a watch was kept for signs of all deficiency states, particular attention was paid to signs of vitamin C deficiency.

The other nutrient in doubtful supply is calcium. However, no simple method exists for a study of the clinical manifestations of calcium deficiency. To do this a long-term investigation involving the use of radiographs is necessary and we were not equipped to do this in this survey.

It was considered valid to limit the clinical survey to children for—

(*a*) They usually reveal signs of deficiency diseases earlier than adults, who have, in general, a greater storage and better capacity for adjustment;

(*b*) The examination of data on supplies of food rich in the vitamin C indicated that it was in the children that the effects of the spring trough were likely to be most severe.

Nutrition authorities now recognise that the most frequent and reliable early clinical signs of vitamin C deficiency are to be seen in the gums, which become red, swollen and bleed easily.

During the medical examination, some thirty odd children were found to be suffering from gum changes strongly suggestive of vitamin C deficiency. The gums were congested, and had a definite purplish tinge. In some cases haemorrhages were actually occurring at the time of inspection, whilst in other cases the congested areas could be made to bleed easily by pressure. Although the dental hygiene was generally bad in most of the children examined, it was not any worse in the children with the bleeding gums.

Although haemorrhagic changes in the gums are strongly suggestive of vitamin C deficiency, the condition can be aggravated by local infection. For this reason it is necessary to test the effect of vitamin C therapy upon the condition. Therefore most of the children were given ascorbic acid tablets for both diagnostic and therapeutic purposes.

The final results are not yet available, but those to hand show that, in some at least of the children the haemorrhagic changes originally noted disappeared with vitamin C therapy.

Discussion

The 1944 food consumption survey demonstrated that in the households surveyed in Tasmania the mean daily intake of ascorbic acid and calcium was below the average for households surveyed in mainland cities and towns. The results of the 1945 survey confirm these findings.

An analysis of available data on the production and consumption of foods rich in vitamin C showed that a trough in supplies occurs in Tasmania in the spring and early summer. The principal factors associated with this trough are the possible reduction in potato supplies, but more particularly to the fact that those available are 'old,' the low supplies of salad vegetables and the relatively low consumption of oranges in comparison with mainland cities. The effects of the last factor are most likely to be found in infants and children.

A clinical survey found a number of children suffering from signs strongly suggestive of sub-acute vitamin C deficiency.

The results of the food survey and the analysis of other data revealed that the milk consumption in Tasmania is appreciably lower than in the mainland States. The findings of the survey demonstrate that the milk consumption in most of the households surveyed in Tasmania with an expectant or nursing mother was below the desirable level. The consumption in the majority of the households in this group in Tasmania was below that in households in the same group in mainland States. For reasons already explained, it was not possible to ascertain whether the lower intake of calcium has been responsible for departures from normal health.

It is now necessary to consider the fundamental causes of the lower consumption of these two nutrients in Tasmania. In any consideration of food consumption patterns it is necessary to consider the economic aspects and, before these nutrition problems in Tasmania can be finally solved, it will be necessary to determine whether the spending power of the bulk of the Tasmanian population is a factor in the lower consumption pattern. Again, money may be available for the purchase of additional food, but, in the absence of nutritional knowledge on the part of the housewife, the appeal of other spending outlets, such as less nutritious foods, beverages and amusements may be greater. I do not propose to discuss in this paper the economic aspects of the problem, partly because I am not competent to do so and also because the necessary basic data have not been assembled. A special survey will be necessary to collect the information.

Leaving aside the broader economic aspects, there are certain other factors which have to be considered in the lower intake of vitamin C and calcium in Tasmania.

1. Vitamin C

Attention has been drawn to the lower supply and so lower consumption of oranges in this State. In this connection it must be borne in mind that the Tasmanian consumer in normal times pays from 2/- to 3/- a bushel more than the Victorian and South Australian consumer in extra distribution costs. (Under wartime difficulties of transport, 4/9 more when they are shipped to Hobart through Burnie or Devonport instead of through Launceston or Hobart.)

In order to raise levels of intake of vitamin C in the spring and early summer, either there must be a higher consumption of oranges or some other source of vitamin C must be provided. If the solution is to be by the former method, then some financial assistance may be necessary to enable an equal distribution of the fruit to all sections of the population. If it is decided to consider other forms of vitamin C, it must be realised that no other concentrated fresh source is available at this time of the year. Two alternatives present themselves to me, either the wider use of preserved blackcurrant juice, properly prepared to conserve its vitamin C content and distributed at a cost within the reach of all sections of the population, or the use of synthetic vitamin C tablets. The decision must rest with the authorities in Tasmania.

Whichever scheme is finally adopted as the most desirable, it is evident that considerable publicity will be necessary. The public will have to be made aware of the problem and of the solutions suggested and the reasons for the actions taken. This may easily prove the most difficult phase of the whole task.

2. Calcium

A lack of awareness, of sections at least of the population, as to the value of milk in the diet, especially for pregnant and nursing women, infants and children, is undoubtedly the most important single cause.

General publicity can achieve results, as is shown by the effects of the Melbourne Metropolitan Milk Board. In 1938 the milk consumption in Melbourne was 4·7 pints per head per week, whilst in 1944 it had risen to 5·6 pints. During the earlier part of the intervening period the Board conducted a vigorous 'drink more milk' campaign.

During pregnancy and the nursing period the majority of women are most anxious to 'do the right thing' in relation to the unborn or newly-born child. This is a time when women are very receptive to advice of all kinds, including advice relating to diet. The medical profession is in an unique position to raise the

dietary level of pregnant and nursing women. I am, however, satisfied that the number of medical practitioners who take pains to investigate a pregnant woman's diet and advise her on the lines to follow is, unfortunately, small.

3. Conclusion

A satisfactory solution to the nutrition problems of Tasmania will be found by the combined efforts of several different groups in the community. The health and nutrition authorities have to point out the problem; the co-operation of the agriculturists and farming experts must be obtained to bridge the gap between ideal requirements and present supply, and, finally, a greater degree of awareness of the importance of a balanced diet and a high nutritional level of food intake must be developed in large sections of the population. These are tasks for a central body of well-informed leaders in community thought.

References

1. *Australian Institute of Anatomy, Staff:* Food Consumption and Dietary Levels in 2730 Australian Family Households in 1944. Canberra, Govt. Printer. (In press.)
2. *National Research Council of America, Food and Nutrition Board: Reprint and Circular Series. No. 115:* Recommended Dietary Allowances, Washington, 1943.
3. *Combined Food Board, Special Joint Committee:* Food Consumption Levels in the United States, Canada and the United Kingdom. London, H.M. Stationery Office. Ottawa, Govt. Printer, 1944.
4. *Commonwealth of Australia, Advisory Council on Nutrition:* Reports, Canberra Govt. Printer, 1936-1938.
5. Honey, M. E.: Seasonal trends in Ascorbic Acid intake in four Capital Cities in Australia. (To be published.)

PLATE I

Fig. 1.—Adelaide, 1938. The levels of intake of vitamin C in each month of the year and the contributions to the total intake made by each of the principal groups of fruits and vegetables.

Fig. 2.—Tasmania, 1945. The relative levels of supply of vitamin C in each month of the year and the contributions to the total intake made by each of the principal groups of fruits and vegetables. The dotted spaces at the top of the columns represent the additional amounts of vitamin C that would be available if the monthly intake of oranges in Tasmania was the same as in Victoria.

Fig. 1

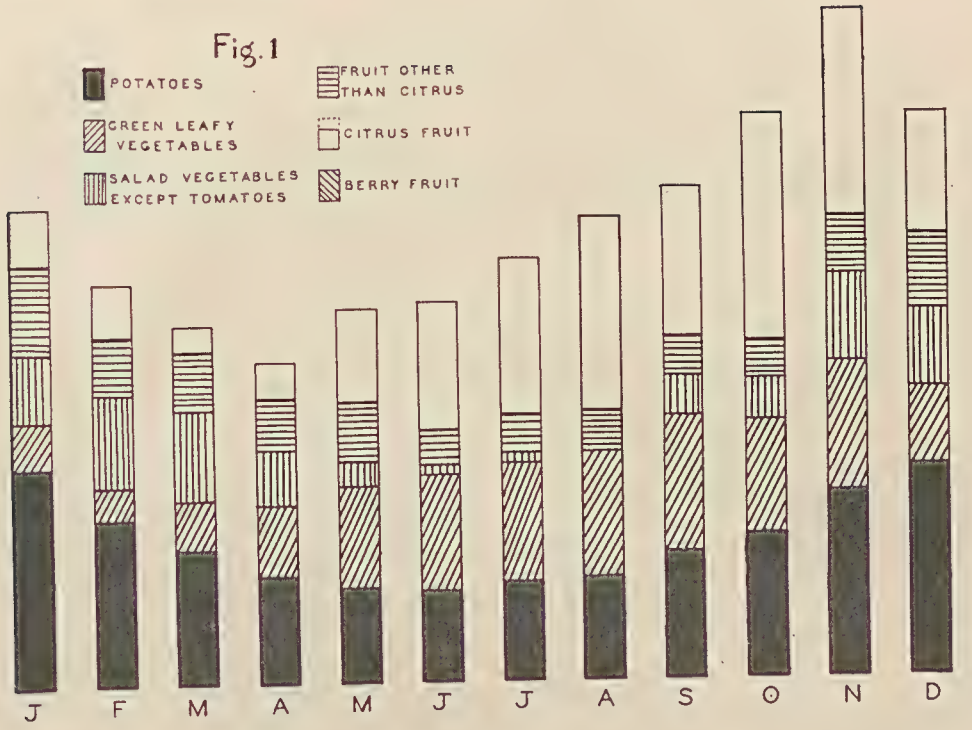
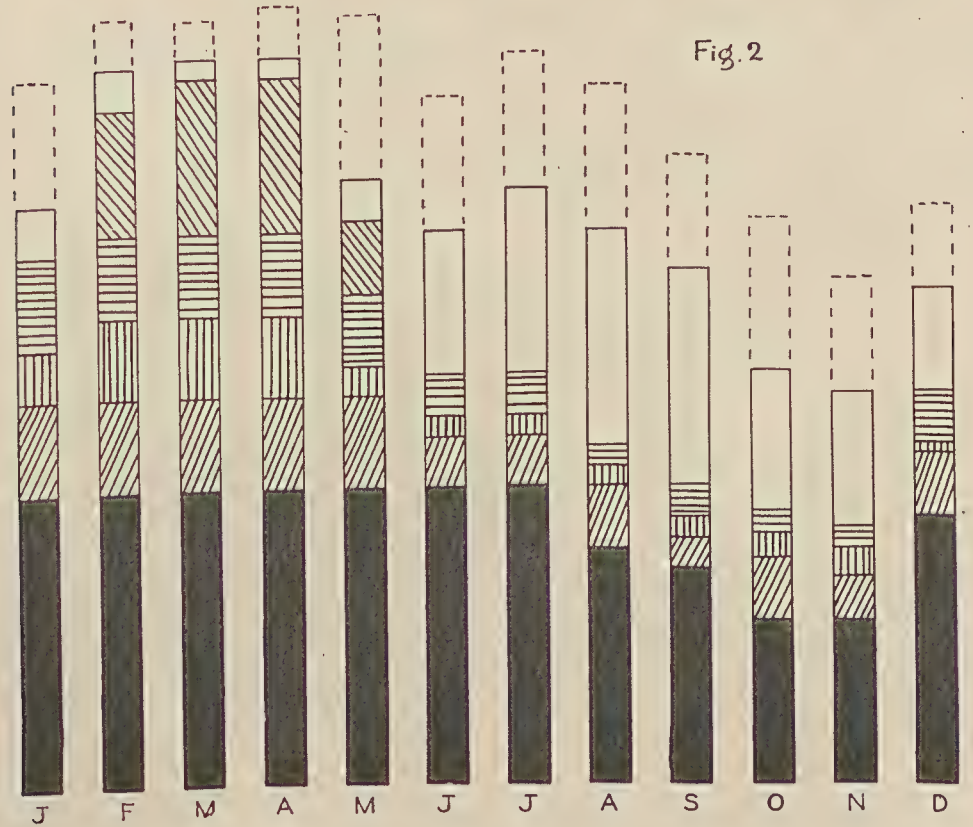

POTATOES
GREEN LEAFY VEGETABLES
SALAD VEGETABLES EXCEPT TOMATOES
FRUIT OTHER THAN CITRUS
CITRUS FRUIT
BERRY FRUIT
J F M A M J J A S O N D

Fig. 2


J F M A M J J A S O N D

The Affinities of the Rat-kangaroos (Marsupialia) as revealed by a comparative study of the Female Urogenital System.

BY

JOSEPH PEARSON

(Read 13th November, 1945)

1. Introduction

According to the accepted view the family Macropodidae is divided into three sub-families, the Hypsiprymnodontinae, the Potoroinae, and the Macropodinae. The members of the first two are collectively known as the rat-kangaroos and the third sub-family comprises the true kangaroos and wallabies.

The present paper is concerned mainly with the rat-kangaroos, which consist of five genera, as follows:—

Sub-family Hypsiprymnodontinae

(1) *Hypsiprymnodon* Ramsay, 1876

Contains a single little-known species recorded from Queensland. This genus is the only form in which the hallux is present. Mainly for this reason it is regarded as the most primitive rat-kangaroo and is usually placed in a separate sub-family from the rest.

Sub-family Potoroinae

(2) *Potoroüs* Desmarest, 1805

Three species have been recorded of which probably only one, *P. tridactylus* (Kerr, 1792), can now be obtained.

(3) *Bettongia* Gray, 1837

There are four species, all of which are rare or extinct, with the exception of the Tasmanian form, *B. cuniculus* (Ogilby, 1838).

(4) *Aepyprymnus* Garrod, 1875

Contains only one species, *Ae. rufescens* (Gray, 1837), which is extremely rare. Nothing is known of its internal anatomy.

(5) *Caloprymnus* O. Thomas, 1888

A single species, *C. campestris* (Gould, 1843), which was re-discovered fifteen years ago after a lapse of ninety years.

The female urogenital system of only two of these genera is known, viz., *Bettongia* (Owen, 1834; Brass, 1880; Pearson, 1944, 1945) and *Potoroüs* (Pearson, 1944, 1945). In the present paper descriptions of the female urogenital system of *Caloprymnus* and *Hypsiprymnodon* are given. Nothing is known of the internal anatomy of *Aepyprymnus*.

2. The Female Urogenital System of Caloprymnus campestris

(Figs 1-3)

Caloprymnus campestris was first described by Gould in 1843 as *Bettongia campestris* from three specimens obtained by Sir George Gray. After a lapse of nearly ninety years a single specimen was obtained by Mr. Reese from the north-eastern part of South Australia, and this important re-discovery led to a special expedition being sent out in 1931, with the result that Mr. Finlayson, Honorary Curator of Mammals, South Australian Museum, secured several specimens of this rare species and made important observations on its habits, external structure, and probable affinities (Finlayson, 1932). Through the good offices of the Director of the National Museum, Melbourne, an opportunity has now been presented of reporting upon its female urogenital system, thereby extending our knowledge of the comparative anatomy of this important group of marsupials. This help so readily afforded is gratefully acknowledged.

The following description of the female urogenital system of *Caloprymnus* is based upon an examination of spirit specimen No. R. 13609 from the collections of the National Museum, Melbourne. The parts described have been dissected but have not been detached from the carcass, and should be available, therefore, for future examination in Melbourne.

The external measurements of the spirit specimen are as follows:—

Length of head and body	34 cm.
Length of tail	33 cm.
Length of ear	3·7 cm.
Length of pes	11·2 cm.

The specimen examined is a mature female. The left uterus is considerably enlarged and contains a foetus which, though recognizable, is not sufficiently well preserved to enable the details of its structure to be made out. However, the urogenital system in general is in a satisfactory state of preservation and no difficulty has been experienced in making out the details which are given below.

A general inspection of the female urogenital system shows that it resembles that of *Potoroïs* to a marked degree, though the anterior vaginal expansion is relatively much larger and bears out the suggestion made in previous papers (Pearson, 1944, 1945) that this portion of the vagina is, in fact, an incipient caecum such as is seen in full development in *Bettongia*.

Uteri (l.ut., r.ut.)

The two uteri would, in normal circumstances, have a somewhat similar appearance to those of *Potoroïs* as described by Pearson (1945), but, as mentioned above, the left uterus of this specimen is considerably enlarged owing to the presence of a foetus, and has a length of 47 mm. (body and neck) and a maximum width of 22 mm. The normal right uterus is 28 mm. long and 12 mm. wide.

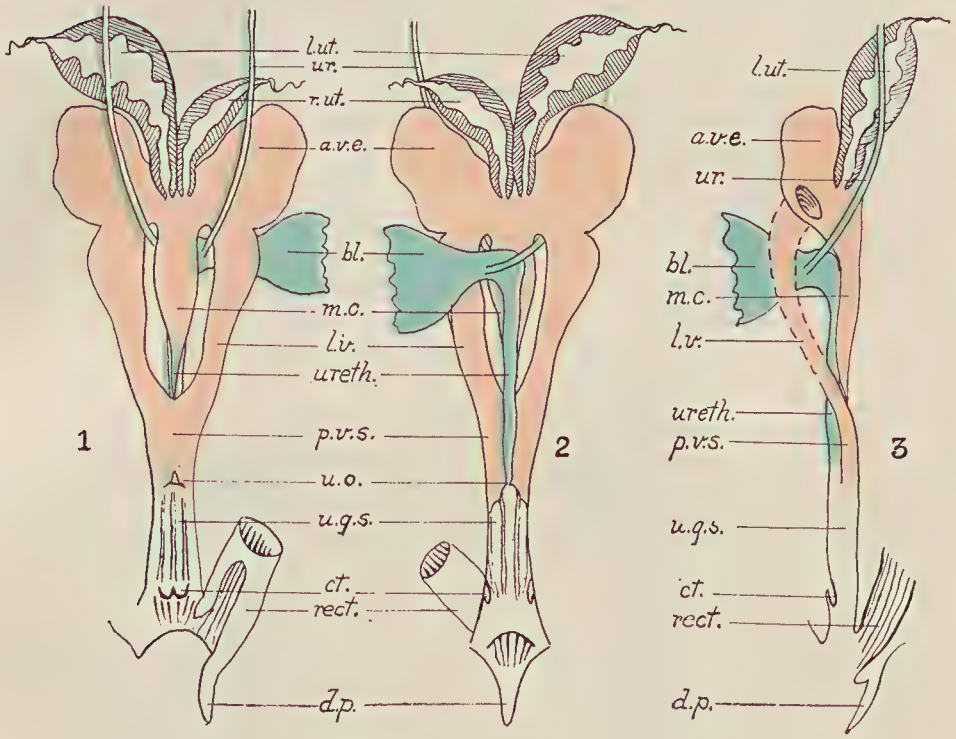
Median vaginal cul-de-sac (m.c.)

This has an extreme length of about 26 mm. and the first (anterior) quarter forms part of the anterior vaginal expansion. The cul-de-sac is about 5 mm. wide in its second quarter and tapers gradually as it passes caudally. It ends blindly immediately anterior to the junction of the two lateral vaginae.

Anterior vaginal expansion (a.v.e.)

This is a commodious, winged chamber formed by the hypertrophy of the anterior portion of the vaginal system. It occupies much the same position as the comparable structure in *Potoroïs*, but differs from it in being larger and possessing two well-defined spheroidal wings which are somewhat flattened dorso-ventrally. The outlines

of these wings are somewhat irregular, which may be due, in part, to the effects of the preservative. This anterior vaginal expansion has a single continuous cavity, the medial portion of which may be regarded as the anterior part of the vaginal cul-de-sac already described. The lumen of each wing opens freely into this central cavity and also communicates posteriorly with the lumen of the contiguous lateral vagina.



(Figs 1-3)

Caloprymnus campestris

Diagrams of the female urogenital system.

FIG. 1.—Horizontal section, Dorsal view x $1\frac{1}{6}$.

FIG. 2.—Horizontal section, Ventral view x $1\frac{1}{6}$.

FIG. 3.—Paramedial section x $1\frac{1}{6}$.

NOTE.—In all figures *pink* represents the vaginal system; *blue* represents the urinary system.

a.v.e.—Anterior vaginal expansion
bl.—Urinary bladder
ct.—Clitoris
d.p.—Digital process projecting from the postero-dorsal lip of the cloaca.
l.l.v.—Left lateral vagina
l.ur.—Left ureter
l.ut.—Left uterus, considerably swollen and containing a foetus.
l.v.—Lateral vagina.
m.c.—Median vaginal cul-de-sac (becoming a true median vagina in fig. 7)
p.v.s.—Posterior vaginal sinus
rect.—Rectum
r.ut.—Right uterus (normal size)
u.g.s.—Urogenital sinus
u.o.—Opening of urethra into urogenital sinus
ur.—Ureter
ureth.—Urethra
ut.—Uterus
v.c.—Vaginal caecum.

The extreme width of the anterior vaginal expansion is about 27 mm. Each wing has an antero-posterior length of about 15 mm. and a width of about 11 mm. As in the case of *Potoroüs* the uterine necks project from the roof of the median portion of the chamber on papillae which are not so well developed as in *Potoroüs*. As in that genus each papilla is perforated near its tip by the os uteri.

Although there can be little doubt that the vaginal system is completely separated into right and left elements in early development, the septum separating the two halves completely disappears in the mature female.

Lateral vaginae (l.v.) and posterior vaginal sinus (p.v.s.)

Each lateral vagina arises from the postero-lateral wall of the corresponding wing of the anterior vaginal expansion and has a length of about 21 mm. The right and left lateral vaginae have a straight course as they pass caudally and gradually converge to meet behind the blind extremity of the median cul-de-sac. They are widest near their anterior end, where they have a width of about 5 mm. and gradually narrow to a width of 3 mm. or less. The two coalesce to form the posterior vaginal sinus, which, as in the case of both *Potoroüs* and *Bettongia*, is a median tube lying immediately dorsal to the posterior section of the urethra. Both the posterior vaginal sinus and urethra open together into the urogenital sinus. The posterior vaginal sinus is 8 mm. long and about 5 mm. wide. It is shorter than the comparable structure in *Potoroüs*, but slightly longer than that of *Bettongia*.

Urinary bladder (bl.) and urethra (ureth.)

As in *Potoroüs* and *Bettongia* the urinary bladder has an extreme anterior attachment situated immediately behind the anterior vaginal expansion (or caecum). The urethra runs ventral to the median cul-de-sac and posterior vaginal sinus, and together with the latter, opens into the urogenital sinus. The urethra has a total length of about 26 mm. It is about 3 mm. wide anteriorly and narrows somewhat towards its posterior end.

Urogenital sinus (u.g.s.)

This is about 14 mm. long and about 5 mm. wide. There is a well-developed clitoris attached to the ventral wall near the posterior extremity.

3. Female Urogenital System of Hypsiprymnodon moschatus

(Figs 4, 5.)

After the present paper had been completed in its original form an unpublished account by Miss F. R. Heighway of the anatomy of this species was brought to the writer's notice through the good offices of Professor Abbie of the Anatomy Department, University of Adelaide. Later Professor Burkitt of the Anatomy Department, University of Sydney, in whose laboratory Miss Heighway's work was carried out, was kind enough to allow the writer to examine a dissection of the female urogenital system of this species which had been made by Miss Heighway in the course of her work. It is desired to express the deepest appreciation of the facilities thus offered. The information obtained in this way has filled an important gap in the known comparative anatomy of this group and has enabled the writer to discuss with greater confidence the affinities and associated problems of these interesting marsupials.

A brief statement of the salient features of the female urogenital system of *Hypsiprymnodon* is given below. This account and the figures which accompany it (figs 4 and 5) are drawn up from the writer's own examination of the material placed at his disposal.

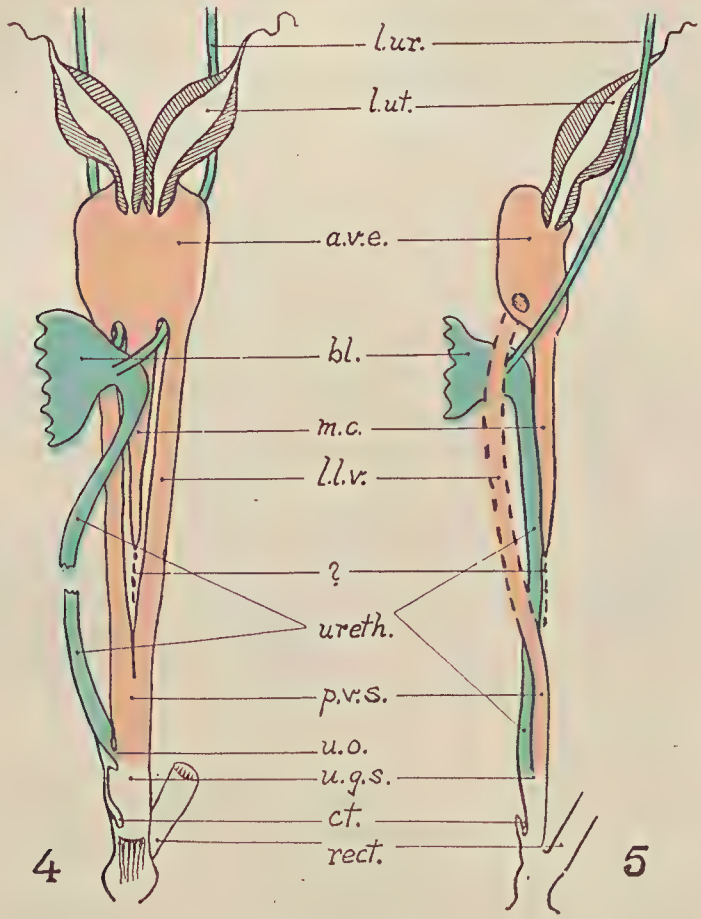
This species falls into line with the other members of the group in so far as the general topography of the urogenital organs is concerned.

Uteri (l.ut.)

These call for no special comment as they closely resemble the comparable structures in all other rat-kangaroos. The two uterine necks are in contact with each other in the middle line.

Median vaginal cul-de-sac (m.c.)

As in the three other genera of the group, this portion of the vaginal system is intimately connected with the anterior vaginal expansion, so much so that the median portion of the latter is for all intents and purposes the anterior portion of the median cul-de-sac. Caudally the cul-de-sac tapers considerably. In the dissected specimen upon which the present description is based the cul-de-sac has been



(Figs 4 and 5)

Hypsiprymnodon moschatus

Diagrams of the female urogenital system.

FIG. 4.—Horizontal section, ventral view. The urethra is displaced from its median position, turned to the right side, and cut about the middle of its course. The ventral wall of the urogenital sinus is shown deflected to the right side so that the clitoris is displaced from its median ventral position. x 1½.

FIG. 5.—Paramedial section. The left lateral vagina which is out of the plane of the section is shown by broken lines. x 1½.

separated from the underlying urethra and would appear to terminate blindly some distance anterior to the point of junction of the converging lateral vaginae. If this is actually so it would mark a difference between *Hypsiprymnodon* and the other genera in this respect. But in the other three genera the cul-de-sac and the urethra are so intimately bound together that the separation of one from the other requires very delicate manipulation. In the other three genera the lumen of the cul-de-sac has actually been traced as far as the level of the junction of the two lateral vaginae, and this has been confirmed in the case of *Potoroïs* by the inspection of serial sections. In the case of an extremely immature specimen the cul-de-sac might be found to be very short, but the specimen examined appears to be from a mature animal. In figs 4 and 5 the possible existence of a posterior extension of the cul-de-sac is indicated by a dotted line (marked ?).

Anterior vaginal expansion (a.v.e.)

This would appear to be the most variable part of the vaginal system in the group. In *Hypsiprymnodon* the condition is reminiscent of that already described in *Potoroïs* (Pearson, 1945). In the specimen examined the outline of this thin-walled chamber is not symmetrical. This may be due to the pressure exerted by surrounding organs after the carcass was placed in preservative.

Length 11 mm. Greatest width 12 mm.

As in the other forms the uterine necks project from the roof of this chamber on two well-defined papillae, lying side by side. Each papilla is perforated by the os uteri.

Lateral vaginae (l.l.v.) and posterior vaginal sinus (p.v.s.)

The lateral vaginae pass straight back from the postero-lateral corners of the anterior vaginal expansion. As they proceed caudally, lying on either side of the median cul-de-sac, they gradually converge and ultimately coalesce to form a common chamber, the posterior vaginal sinus, which, as in the other three forms, lies dorsal to the posterior portion of the urethra. Each lateral vagina is about 27 mm. long and the posterior vaginal sinus is about 9 mm. long.

Urinary bladder (bl.) and urethra (ureth.)

As is seen in figs 4 and 5, the attachment of the bladder lies nearly as far forward as the posterior extremity of the anterior vaginal expansion. This conforms to the arrangement found in the other three genera. The urethra has a total length of about 30 mm. and opens near the base of a well-defined papilla.

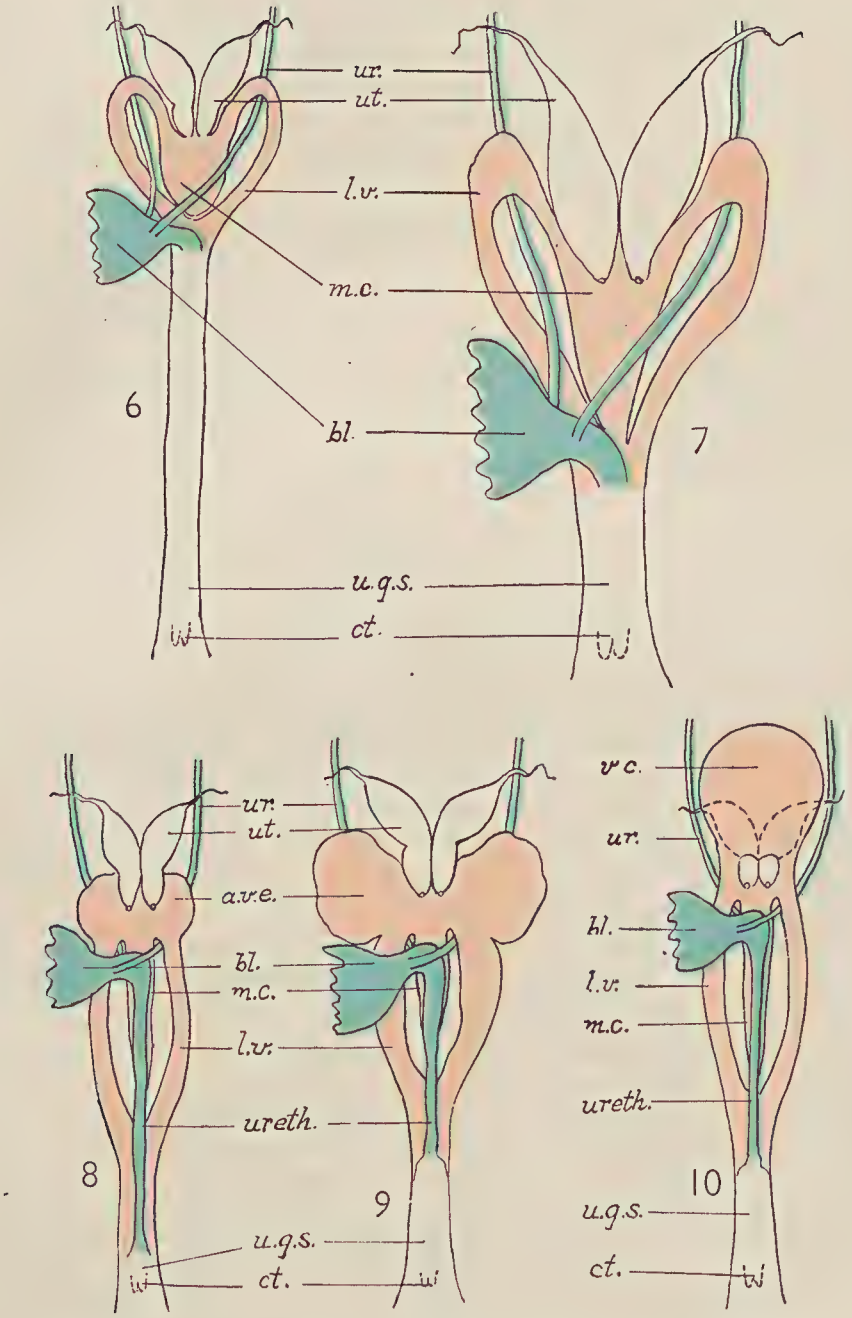
Urogenital sinus (u.g.s.)

This is extremely short and is about 6 mm. in length to the level of the clitoris.

4. The Inter-relationships of the Rat-kangaroos

(Figs 1-10)

A comparison of the female urogenital systems of *Bettongia, Potoroïs, Caloprymnus,* and *Hypsiprymnodon* (figs 1-5, 8-10) makes it clear that they follow the same common design and differ from the phalangers and kangaroos (figs 6, 7) in at least three important respects, viz., the presence of an anterior vaginal expansion, or its homologue the vaginal caecum; the anterior attachment of the urinary bladder with an extremely long urethra; and the presence of a posterior vaginal sinus.



Diagrammatic horizontal sections of the female urogenital system, seen from the ventral side.

FIG. 6.—*Petaurus breviceps* (Phalangeridæ) x 3.
FIG. 7.—*Thylogale billardierii* (Macropodidae) x 1.
FIG. 8.—*Potoroïs tridactylus.*
FIG. 9.—*Caloprymnus campestris.* } (Potoroidae) x 1.
FIG. 10.—*Bettongia cuniculus.*

The following table gives a statement of the relative size of each part of the female urogenital system in these four genera based in all cases upon measurements taken from specimens preserved in spirit or formalin:—

	Bettongia	*Potoroïs*	*Caloprymnus*	*Hypsiprymnodon*
Total length of urogenital system from anterior end of uteri to clitoris	58 mm.	55 mm.	60 mm.	63 mm.
Percentages of total lengths.				
Extreme length of median cul-de-sac (including median portion of anterior vaginal expansion)	55%	64%	45%	?
Length of lateral vaginae	46%	54%	35%	47%
Length of posterior vaginal sinus	10%	27%	13%	12%
Length of urogenital sinus as far back as the clitoris	24%	11%	23%	9%
Length of urethra	52%	75%	43%	50%

Since the first genus, *Potoroïs*, was established by Desmarest in 1804 the classification of this group of marsupials has been based upon external characters alone and principally upon foot-structure and dentition. It is surprising to find that taxonomists, who are vitally concerned with phyletic problems, should be satisfied with the evidence of external characters only and should ignore, more often than not, the study of comparative anatomy for their purpose. It is a fitting commentary upon the evaluation of the basic characters which should serve as a guide to phylogeny that until a year ago our knowledge of the internal morphology of the rat-kangaroos was confined to the genus *Bettongia*. Based upon external characters alone it is difficult to assess the precise relationships of the various genera within the group, and the evidence from foot-structure and dentition is confusing and contradictory. For instance, *Caloprymnus* resembles *Bettongia* in at least three points, the character of the pes, the appearance of the rhinarium, and the presence of a characteristic finger-shaped process on the postero-dorsal margin of the cloaca. On the other hand, it approaches closely to *Potoroïs* in its dentition. Again *Hypsiprymnodon* possesses a well-developed hallux, a primitive character which distinguishes it from the rest of the rat-kangaroos. *Potoroïs* resembles it more closely in foot-structure than *Bettongia* or any of the other genera which have highly specialized feet reminiscent of the condition found in the true kangaroos (see fig. 11). But *Hypsiprymnodon* has a similar type of dentition to *Bettongia*. Bensley (1903) drew attention to this contradictory evidence and came to the conclusion that ' the correct plan of division is according to dentition '.

It has been stated above (p. 13) that the accepted classification of the rat-kangaroos separates *Hypsiprymnodon* from the others because of the possession of the hallux. But this in itself can hardly be regarded as sufficient reason for establishing a separate sub-family. Both the dasyures and peramelids, for example, show variability in this character. Neither is there sufficient justification for Bensley's classification based upon tooth-structure which, though still recognizing two sub-families, places what is here regarded as the most primitive genus, *Hypsiprymnodon*, in the same sub-family as the most highly specialized form, *Bettongia*. Bensley considered the rat-kangaroos to be diphyletic in origin and grouped *Potoroïs* and *Caloprymnus* together in the sub-family Potoroinae as

having arisen from some primitive phalanger by a different line from the other three genera which he placed in the sub-family Bettongiinae (see fig. 12). It has been shown in a previous communication (Pearson, 1945) and in the present paper that the homogeneous plan upon which the female urogenital system of the rat-kangaroos is built indicates clearly not only community of origin of all members of this group but also fundamental differences from all other diprotodonts.

Bensley attempted to reconcile the contradictions which result from the study of foot-structure and dentition by postulating that the phalangerine stocks from which the rat-kangaroos have sprung were homogeneous in foot-structure, though diversified in dentition. This assumption is neither convincing nor satisfactory and the impression is created that these two sets of characters, taken either singly or collectively, give no reliable indication of the true affinities of the various genera of rat-kangaroos. Gregory (1910) in his classic monograph on the Mammalia sounded a warning against attaching too much importance to either of these characters, both of which are liable to be affected by external influences. In his opinion structures should be sought which are relatively stable and less susceptible to changes in external conditions. He instanced the urogenital system, the brain and skull as presenting more reliable evidence of phyletic relationship.

In the rat-kangaroos foot-structure and tooth-character, particularly the former, have been affected by the widely diverse conditions under which the different genera have been evolved. On the other hand, the evidence collected in the present paper and in a previous communication (Pearson, 1945) serves to emphasize the stability of the female urogenital system which follows a common design throughout the group. The only striking deviation from this plan is seen in the degree of development of the anterior vaginal expansion, but it has been shown (Pearson, 1945) that the small size of this structure in *Potoroüs* is merely an early stage in the development of the large caecum of *Bettongia*. This difference could hardly be attributed to the effects of environmental changes. The present writer therefore agrees with Gregory that the comparative morphology of the female urogenital system provides a reliable guide to the phylogeny of a group.

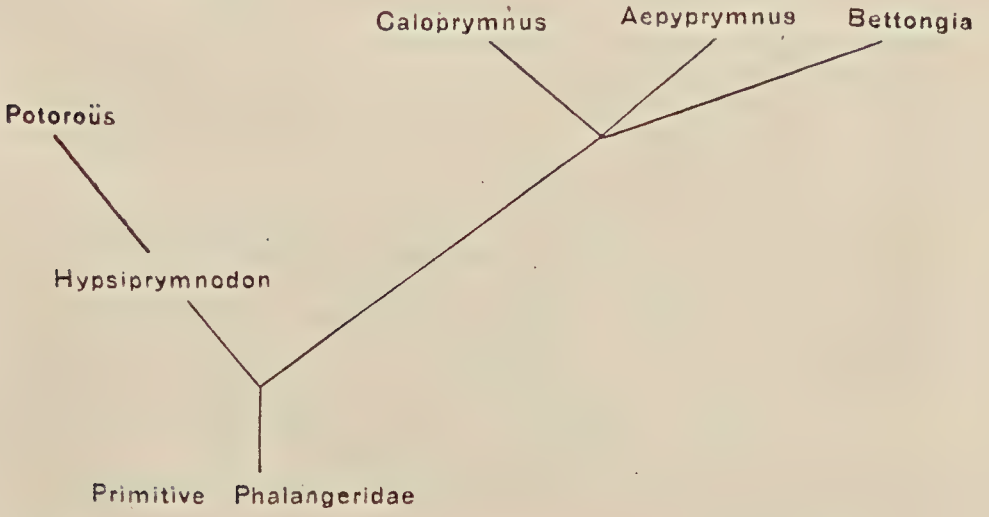


FIG. 11.—Probable inter-relationships of the rat-kangaroos based upon foot-structure.

The genera *Hypsiprymnodon*, *Potoroüs*, *Caloprymnus*, and *Bettongia*(1) agree on the following important points in the female urogenital system:—

(1) There is a gradual elaboration of the anterior portion of the vaginal system from a small, though well-defined, enlargement (anterior vaginal expansion) in *Hypsiprymnodon* and *Potoroüs*; through *Caloprymnus* in which this expansion assumes greater proportions; and culminating in the condition found in *Bettongia* where the large vaginal caecum is an obvious further development of the condition found in *Caloprymnus*. In other words, the relatively insignificant anterior vaginal expansion of *Potoroüs* and *Hypsiprymnodon* may be regarded as the precursor of the large caecum found in *Bettongia*. The presence of this cæcum, either in the incipient stages or in its full development, must be regarded as a departure from the prototypal condition.

(2) Unlike the usual marsupial arrangement the urinary bladder is attached a considerable distance anterior to the urogenital sinus and consequently there is an extremely long urethra opening into a relatively short urogenital sinus. As already pointed out (Pearson, 1945) this is a highly specialized condition found nowhere else in the Marsupialia except in the Peramelidae.

(3) The two lateral vaginae do not open directly into the urogenital sinus but coalesce to form a median sinus, the posterior vaginal sinus, lying dorsal to the urethra. This is a substantial structure varying in length between 10% to 27% of the total extent of the urogenital system. So far as is known this arrangement is not found elsewhere in the marsupials and must be regarded as a specialized development (see Pearson, 1945).

(4) The lateral vaginae commence at the postero-lateral corners of the anterior vaginal expansion (or its homologue the vaginal caecum) and then follow a straight course in a caudal direction on each side of the median cul-de-sac. In this respect the rat-kangaroos differ from most other marsupials

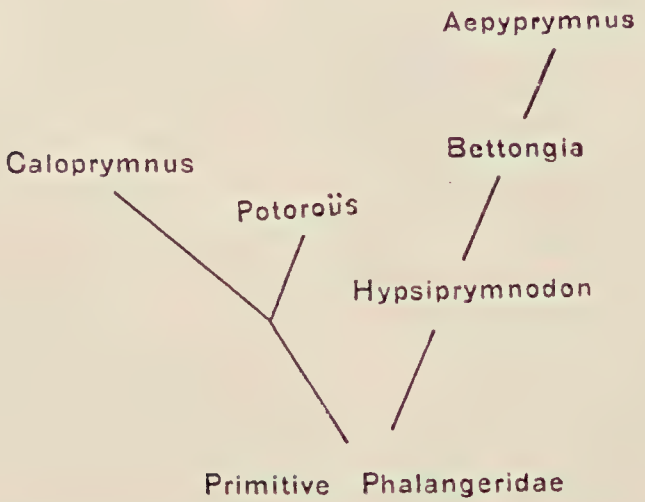


FIG. 12.—Probable inter-relationships of the rat-kangaroos based upon dentition. (After Bensley.)

(1) Nothing is known of the female urogenital system of *Aepyprymnus*.

in which the lateral vaginae follow a devious course and have a shape like the handles of a vase (figs 6 and 7). The Peramelidae are an exception to this. The straight course which these canals take in the rat-kangaroos is probably correlated with the special type of parturition (see No. 5 below).

(5) It is known that in at least one genus (*Potoroïs*) parturition takes place through the lateral vaginae (Flynn, 1923; Pearson, 1945). This is probably true also of *Bettongia*. In the specimen of *Caloprymnus* described in the present paper an intra-uterine foetus was present and the lateral vaginae were swollen so as to suggest that they were being prepared for parturition. It is not unlikely that in all the genera of this group parturition takes place through the lateral vaginae. This, however, is not a primitive condition but a secondary return to it(1).

The plan of the urogenital system is extraordinarily uniform throughout the group, though, as stated above, the condition of the anterior vaginal expansion is variable.

The following conclusions may be drawn from this comparative study of the rat-kangaroos:—

(1) Foot characters and dentition often provide conflicting evidence. Taken separately or together they do not give a satisfactory picture of true relationships. On the other hand, the female urogenital system offers a reliable criterion of phyletic affinities.

(2) The female urogenital system of the rat-kangaroos shows uniformity of design combined with a high degree of specialization.

(3) The peculiarly specialized nature of the female urogenital system of the rat-kangaroos indicates (*a*) that they form a small homogeneous group of genera with close affinities and (*b*) that they differ from all other marsupials.

(4) The rat-kangaroos are a natural group of cursorial and saltatorial marsupials which live under diverse conditions. These conditions have produced variability in foot-structure and dentition but have not affected materially the homogeneous nature of the female urogenital system.

(5) Contrary to the opinion expressed by Bensley, the rat-kangaroos are a monophyletic group and there would appear to be no justification for his division of the group into two sub-families indicative of a dual origin from primitive phalangers.

(6) Neither is there any justification for the generally accepted classification of the group in which *Hypsiprymnodon* is placed in a separate sub-family from the others. The presence of a hallux in this genus is not in itself sufficient reason for separating it from the other genera in which the first toe is absent.

(7) The variability of the anterior vaginal expansion provides a means of assessing the inter-relationships of the genera within the group. The most primitive form is *Hypsiprymnodon* (possession of hallux and the rudiment of the vaginal caecum). At the other end of the series is the specialized *Bettongia* in which the caecum attains its fullest development. The complete sequence is *Hypsiprymnodon, Potoroïs, Caloprymnus, Bettongia.*

---

(1) In addition to these five characters, the rat-kangaroos possess an important diagnostic character in the skull. The squamosal makes a wide contact with the frontal, a characteristic of all rat-kangaroos and bandicoots, as pointed out by Finlayson (1932). In all other marsupials the parietal makes contact with the alisphenoid, thus separating the frontal and squamosal.

(8) It would appear, therefore, that the rat-kangaroos are a highly specialized, but homogeneous, group which have arisen from some primitive phalanger and the affinities of the various genera are indicated in fig. 13.

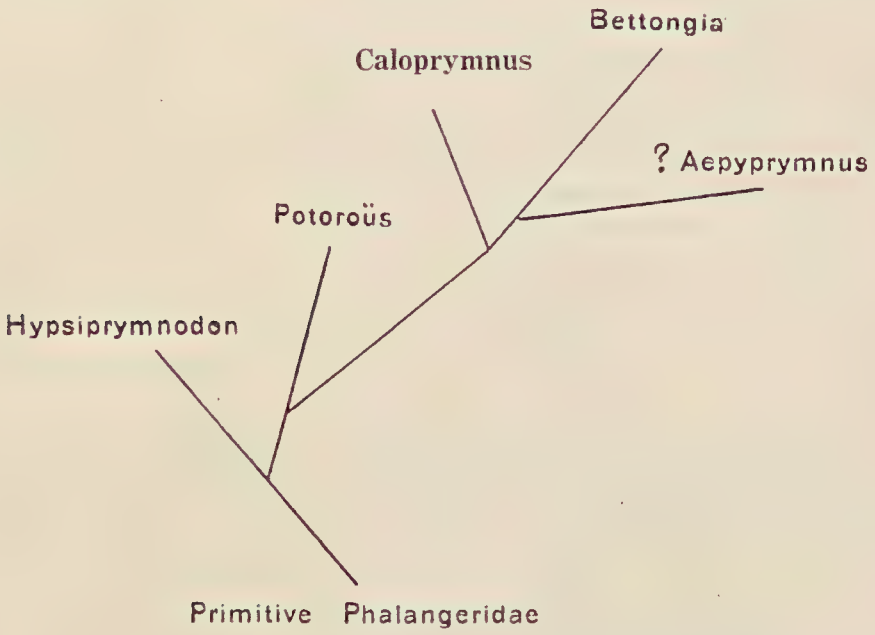


FIG. 13.—Probable inter-relationships of the rat-kangaroos based upon the female urogenital system.

This figure agrees closely with fig. 11 based upon foot-structure and does not fall into line with Bensley's conclusions based upon dentition as given in fig. 12. The presentation of the comparative features of the female urogenital system given in the present paper shows how inconceivable it is that the rat-kangaroos can be regarded as a diphyletic group or that *Hypsiprymnodon* is more closely related to *Bettongia* than it is to *Potoroüs*, as Bensley claims.

5. THE RELATIONSHIP OF THE RAT-KANGAROOS TO THE TRUE KANGAROOS.

It has been shown in a previous paper (Pearson, 1945) that a logical serial evolution of the female urogenital system in the Marsupialia can be traced from the primitive American Didelphidae at one end of the series to the specialized Macropodidae at the other end, with intermediate links being provided by the Australian polyprotodonts and the Phalangeridae. Neither the bandicoots nor the rat-kangaroos find a place in this sequence. The members of the former group, though possessing a primitive type of dentition, have a specialized pes and a female urogenital system which is a curious mixture of primitive and highly specialized features. In the rat-kangaroos this system shows a high degree of specialization, and, though homogeneous throughout the group, it is fundamentally different from that of either the phalangers or true kangaroos (see figs 6-10). If the rat-kangaroos are an off-shoot of some primitive phalangerine stock, as may well be the case, they have departed from the Phalangeridae-Macropodidae line of evolution.

Bensley's conclusions based upon an exhaustive and critical examination of foot-structure and dentition support the view, commonly accepted by all systematists, that the rat-kangaroos belong to the family Macropodidae. He regarded the rat-kangaroos as being more primitive than the true kangaroos and thought it possible that either the latter arose from the *Potoroïs-Caloprymnus* stock, or that both groups arose from a common primitive *Dromicia*-like phalanger. But it has been shown in the present paper that the rat-kangaroos are not a primitive group. On the contrary, their female urogenital system is a considerable departure from the simple general marsupial plan in which the lateral vaginae are convoluted, a vaginal caecum is not developed, and the urinary bladder is attached by a very short urethra to the anterior end of the urogenital sinus.

On the evidence which has been brought together in the present paper, it is impossible to conceive that the rat-kangaroos have given rise to the true kangaroos or have such general affinities with that group as to warrant their being placed in the same family. It is proposed, therefore, to remove the five genera of rat-kangaroos from the family Macropodidae and to establish a new family, the Potoroidae, for their reception, and the genus *Potoroïs* Desmarest, 1804, is named as the type-genus.

6. Summary

Systematists are agreed that the rat-kangaroos should be included in the family Macropodidae. This conclusion is based upon the consideration of external characters only, such as foot-structure and dentition, but it is doubtful whether such features, which are readily susceptible to environmental influences can have much phyletic value. It is claimed that the female urogenital system of the marsupials provides a more reliable guide to phylogeny. An account of this system in *Caloprymnus campestris* and *Hypsiprymnodon moschatus* is given in the present paper and it is further shown that the female urogenital system of the four genera *Hypsiprymnodon, Potoroïs, Caloprymnus,* and *Bettongia* is based upon a common plan which differs in several fundamental respects from that of the true kangaroos and all other marsupials. It is contended that (1) the rat-kangaroos are a monophyletic group and that Bensley's view that the rat-kangaroos arose from two separate primitive phalangerine stocks cannot be sustained, (2) the rat-kangaroos are a highly specialized offshoot from primitive phalangers and cannot be regarded as being closely related to the true kangaroos, as the accepted classification would indicate. It is considered, therefore, that the rat-kangaroos should be placed in a separate family, the Potoroidae.

References

Bensley, B. A., 1903.—On the evolution of Australian Marsupialia with remarks on the relationships of the marsupials in general. *Trans. Linn. Soc. Lond.* (2). *9.* part 3, 83-217.

Brass, A., 1880.—Beiträge zur Kenntniss des weiblichen Urogenital-systems der Marsupialen. *Inaug. Diss.* Leipzig.

Finlayson, H. H., 1932.—Caloprymnus campestris. Its recurrence and characters. *Trans. & Proc. R.S. South Austr. 56,* 148-167.

Flynn, T. T., 1923.—Remarks on the method of Parturition in Potoroüs tridactylus. *Proc. Linn. Soc. N.S.W. 47,* 1922 (1923). Part 5. xxviii.

Gregory, W. K., 1910.—The Orders of Mammals. *Bull. Amer. Mus.* N.H. *27.*

Owen, R., 1834.—On the generation of Marsupial Animals with a description of the impregnated uterus of the Kangaroo. *Phil. Trans. Roy. Soc.,* 1834. part 1, 333-364.

Pearson, J., 1944.—The Vaginal Complex of the Rat-Kangaroos. *Austr. Journ. Sci. 7,* 80-83.

————, 1945.—The Female Urogenital System of the Marsupialia with special reference to the Vaginal Complex. *Pap. Proc. Roy. Soc. Tas.* 1944 (1945), 71-98.

Notes on the Tasmanian Marine Crayfish, *Jasus lalandii* (Milne Edwards)

By

V. V. Hickman

Ralston Professor of Biology, University of Tasmania

(Read 13th November, 1945)

The common marine crayfish, *Jasus lalandii* (Milne Edwards), which is taken in large numbers off the coast of Tasmania, occurs also in the waters round New Zealand, South Africa, Juan Fernandez and Tristan da Cunha.

Although the crayfish is of considerable importance to the sea fisheries of this State, reliable data concerning its habits and mode of life under local conditions are not available. In South Africa, however, various phases of the life of the crayfish have been studied and valuable information gained.

With the object of obtaining data concerning the biology of the crayfish in Tasmanian waters, an investigation was carried out in the Biology Department of the University of Tasmania during the five years 1937-1942. Owing to the difficulties of collecting crayfish at a number of separate localities round the coast, it was decided to confine the investigation mainly to crayfish from one locality, namely, Wedge Bay, on Tasman Peninsula.

The crayfish were caught in 'crayfish pots' similar to those used by local fishermen. Fishing was carried out at approximately fortnightly intervals. Six 'pots' were employed at the one time. On each occasion they were baited and put down for a period of three hours. The total catch was then forwarded to the University, together with a record of the temperature of the water, the depth, and the distance from the shore at which the fishing was carried out.

During the five-year period 1058 specimens of *Jasus lalandii* and two specimens of *Jasus verreauxi* (Milne Edwards) were caught and examined. The following notes refer to *Jasus lalandii*.

Numbers of Crayfish Caught

Of the 1058 crayfish caught one was a pseudohermaphrodite and has been described in a previous paper (Hickman, 1945). The remaining 1057 consisted of 485 males and 572 females. Of the 572 females, 310 were 'in berry' and 262 not 'in berry.' Although the numbers taken each month are small, they may be of some interest and are therefore recorded in Tables I, II, and III.

TABLE I

Jasus lalandii

NUMBER OF MALES TAKEN EACH MONTH DURING THE FIVE-YEAR PERIOD

Month	1937	1938	1939	1940	1941	1942	Total
January	—	9	2	3	14	10	38
February	—	17	9	12	3	15	56
March	2	16	7	6	21	2	54
April	7	3	1	4	1	—	16
May	26	13	3	4	12	—	58
June	17	20	6	18	15	—	76
July	14	6	12	9	7	—	48
August	4	1	4	16	12	—	37
September	9	0	2	6	1	—	18
October	4	1	1	4	8	—	18
November	6	2	1	10	8	—	27
December	16	7	14	1	1	—	39
Totals	105	95	62	93	103	27	485

TABLE II

Jasus lalandii

NUMBER OF FEMALES 'IN BERRY' TAKEN EACH MONTH DURING THE FIVE-YEAR PERIOD

Month	1937	1938	1939	1940	1941	1942	Total
January	—	0	0	0	0	0	0
February	—	0	0	0	0	0	0
March	0	0	0	0	0	0	0
April	1	0	0	0	0	—	1
May	13	13	10	3	16	—	55
June	26	33	9	20	14	—	102
July	25	13	9	12	7	—	66
August	4	1	10	21	7	—	43
September	11	0	10	17	1	—	39
October	0	0	1	1	1	—	3
November	0	0	0	0	0	—	0
December	0	0	0	1	0	—	1
Totals	80	60	49	75	46	0	310

TABLE III

Jasus lalandii

NUMBER OF FEMALES NOT 'IN BERRY' TAKEN EACH MONTH DURING THE FIVE-YEAR PERIOD

Month	1937	1938	1939	1940	1941	1942	Total
January	—	18	6	15	10	3	52
February	—	7	14	16	3	7	47
March	0	9	3	4	9	0	25
April	2	0	0	1	0	—	3
May	0	1	0	0	1	—	2
June	1	2	0	1	1	—	5
July	0	2	2	0	0	—	4
August	0	0	2	2	1	—	5
September	0	0	1	2	1	—	4
October	1	0	5	0	0	—	6
November	6	1	5	4	7	—	23
December	38	16	28	2	2	—	86
Totals	48	56	66	47	35	10	262

PROPORTION OF MALES TO FEMALES

From the numbers given in Tables I, II, and III, it will be seen that there is no constancy in the proportion of males to females in the monthly catches. In April the catches consist largely of males. This is no doubt due to the fact that the females are preparing to lay their eggs and therefore do not enter the 'pots.' In December the catches often contain twice as many females as males. In referring to *Jasus lalandii* on the coast of South Africa, Von Bonde and Marchand (1935, p. 23) make a similar observation. They state 'Male and female crawfish do not occur in any regular or constant proportions on the fishing grounds, but may vary from time to time, and place to place, and even in the same restricted area, from a pure male population to a pure female population'.

In the report of the Sea Fisheries Board of Tasmania for the years 1933-39, page 26, it is stated that 'female crayfish only enter the "pots" to any marked extent when carrying "berry"'. This statement implies that female crayfish, when not 'in berry' do not enter the 'pots' to any marked extent. A reference to Table III will show that during December, January, and February, female crayfish, which are not 'in berry,' enter the 'pots' in considerable numbers, though not to the same extent as do the 'berried' females during May, June, and July.

SIZE AND WEIGHT

The length of the carapace of each specimen was measured from the tip of the rostrum to the middle of the posterior margin of the carapace. Each specimen was also weighed. The largest male crayfish caught at Wedge Bay had a carapace-length of 15·9 cms. and weighed 1878 grammes. The smallest male had a carapace-length of 6·3 cms. and weighed 128 grammes. Table IV gives the sizes and weights of some of the males taken.

TABLE IV

Jasus lalandii

SIZE AND WEIGHT OF MALES

Carapace-length in cms.	Minimum weight in grammes	Maximum weight in grammes	Average weight in grammes	Number of specimens examined
6·3	—	—	128	1
7·0	166	177	171	2
7·5	229	232	230	2
7·8	220	260	247	4
8·0	—	—	280	1
8·2	255	293	282	4
8·4	294	342	309	4
8·6	320	330	324	3
8·8	335	370	350	6
9·0	335	422	373	10
9·2	374	461	412	9
9·4	415	461	437	11
9·6	407	510	468	12
9·8	468	560	489	12
10·0	465	574	510	16
10·2	503	597	548	9
10·4	524	645	575	22
10·6	588	701	645	20
10·8	600	705	659	6
11·0	670	780	722	4
11·2	673	794	715	9
11·4	645	843	778	17
11·6	744	916	816	12
11·8	792	945	841	10
12·0	865	999	913	8
12·5	992	1114	1064	3
13·0	1077	1195	1119	3
13·5	1148	1240	1194	2
14·0	1422	1474	1448	2
14·8	1478	1509	1493	2
15·5	—	—	1807	1
15·9	—	—	1878	1

The largest female caught measured 12·4 cms. in carapace-length and weighed 1099 grammes. The smallest female had a carapace-length of 6·3 cms. and weighed 129 grammes. Table V gives the sizes and weights of some of the females taken.

TABLE V

Jasus lalandii

SIZE AND WEIGHT OF FEMALES

Carapace-length in cms.	Minimum weight in grammes.	Maximum weight in grammes.	Average weight in grammes.	Number of specimens examined
6·3	—	—	129	1
7·1	191	206	198	2
7·5	214	247	231	5
7·8	241	314	274	10
8·0	274	339	298	8
8·2	290	327	310	8
8·4	280	406	351	14
8·6	326	413	367	13
8·8	336	410	374	8
9·0	315	504	411	19
9·2	375	514	445	15
9·4	400	553	494	22
9·6	432	596	524	19
9·8	432	583	511	16
10·0	465	659	560	25
10·2	517	747	595	10
10·4	503	672	609	17
10·6	567	744	673	10
10·8	600	737	703	6
11·0	640	785	726	11
11·2	652	780	726	5
11·4	701	865	770	5
11·6	—	—	787	1
11·9	843	952	897	5
12·1	840	985	915	3
12·4	—	—	1099	1

SEXUAL MATURITY

Of the 572 females examined during the present investigation, the smallest one, which, by the presence of empty egg-capsules on the pleopods, gave evidence of having carried eggs, measured 7·2 cms. in carapace-length. The smallest specimen actually 'in berry' had a carapace-length of 7·4 cms. The eggs of this specimen contained embryos at the late nauplius stage of development and therefore had been fertilized.

In South Africa, Von Bonde (1936, p. 8) reports having observed females 'in berry' when they measured only 4·5 cms. (1·75 inches) in carapace-length. T. Challenger (1943, p. 51) states that in Tasmanian waters females of only 1·5 inches have been found carrying eggs, 'which proved, however, to be unfertilized'.

The male crayfish does not appear to reach sexual maturity as early as the female. A small specimen collected from drifted kelp on the beach at Kingston had a carapace-length of 2·2 cms. It showed no signs of external genital apertures. A second specimen collected at the same locality had a carapace-length of 3·9 cms. (1·5 inches) and, although the genital apertures were present on the coxopodites of the fifth pereiopods, they were closed by a membrane and appeared to be non-functional.

The smallest male taken at Wedge Bay had a carapace-length of 6·3 cms.. It was caught on 23rd July, 1938. Dissection of the specimen showed that the testes were but slightly developed and, although the external genital apertures were quite distinct, the vasa deferentia leading to them were not yet formed. A similar condition of the reproductive system was also observed in a male having a carapace-length of 6·8 cms.

During March, April, and May it was not unusual to catch males in which the vasa deferentia were so distended with viscous seminal fluid that spermatophores were partially extruded through the genital apertures. This condition was observed in males having a carapace-length of 9·4 cms. Such males were obviously sexually mature. It seems probable, however, that males attain sexual maturity on reaching a carapace-length of about 8·0 cms.

Shelling or Ecdysis

The casting of the exoskeleton or shell of the crayfish not only allows for the growth of the animal, but also renews the chitinous parts of the various superficial sensory organs, thus helping to restore any sensitivity that may have been lost through wear and tear, or through the action of encrusting marine organisms. Young crayfish may cast their shell several times in the year. Von Bonde and Marchand (1935, p. 15) have shown that even a mature female having a carapace-length of 9·0 cms. may undergo ecdysis twice in the one year.

In endeavouring to determine the time of year at which crayfish in Wedge Bay cast their shells, a record of the condition of the exoskeleton of each specimen was kept. As ecdysis approaches the flesh of the crayfish becomes pink, and the developing new shell takes on a dark colour and separates easily from the overlying old shell. Male crayfish showing these features were usually caught during September and October. While undergoing ecdysis crayfish do not feed. There is thus a marked decrease in the number of males taken during the shelling period. Reference to Table I will show that this falling off in numbers occurs during September and October. A marked decrease in the number of males also takes place during April. This, however, is due to the fact that the males are busy mating with the females at that period.

Immediately after ecdysis the new exoskeleton is very soft. It gradually hardens, however, and when it has become firm enough for the crayfish to move about, the animals, made hungry by their fast during ecdysis, readily enter the 'pots'. As a consequence there is an increase in the number of males taken during November and December. Moreover, most of the males caught during these months have clean shells, which are free from barnacles, serpulids, algae and other marine growths. The above evidence makes it clear that male crayfish at Wedge Bay usually cast their shells during September and October. It must not be inferred, however, that all male crayfish in the locality undergo ecdysis at the one time. A few specimens with new and somewhat soft shells were caught during January, February, March, May, and June. These are listed in Table VI.

TABLE VI

Jasus lalandii

NUMBER AND SIZE OF SOFT-SHELLED MALES TAKEN IN MONTHS OTHER THAN SEPTEMBER AND OCTOBER

Date when Caught	Carapace-length in cms.	Weight in grammes.	Number of Specimens
27th June, 1938	9·4	461	1
27th February, 1940	9·7	415	1
14th March, 1940	10·0	504	1
14th March, 1940	9·4	301	1
14th March, 1940	8·3	255	1
14th March, 1940	8·1	252	1
6th January, 1941	12·1	850	1
6th January, 1941	9·5	442	1
12th May, 1941	10·0	488	1
10th June, 1941	8·9	365	1
10th June, 1941	8·8	370	1
23rd June, 1941	10·0	505	1

The soft-shelled males mentioned in Table VI form a very small proportion of the total number of males caught. However, as they were taken at times other than the usual shelling period, they serve to contradict the statement sometimes made that all the males in a given locality moult at the same time (Challenger, 1943, p. 53).

Female crayfish at Wedge Bay generally undergo ecdysis during April, and as a consequence very few of them enter the 'pots' during that month (see Tables II and III). Egg-laying is always preceded by ecdysis. Von Bonde and Marchand (1935, p. 15) have shown that the time which elapses between moulting and spawning may vary from 8 to 48 days. In a later publication Von Bonde (1936, p. 9) says 'Egg-laying usually follows ecdysis by about two or three days'.

Females carrying recently laid eggs were caught during April, May, and June. It is therefore probable that the moulting period is spread over these months. The majority of the females, however, appear to cast their shells in April.

While it is true that egg-laying is always preceded by ecdysis, it does not follow that ecdysis is always succeeded by egg-laying. A few soft-shelled females, which were not 'in berry,' were caught during May and June. Some females moult twice within the year. When this occurs spawning takes place after the second moult (Von Bonde and Marchand 1935, p. 15), and not after the first.

THE TIME OF SPAWNING AND HATCHING

No females carrying external eggs were caught during January, February, and March. The earliest date in any one year at which a female 'in berry' was taken was 26th April and the latest date 7th December (see Table II). A total of 310 females 'in berry' was caught during the five-year period. The eggs of each one were examined in order to determine the stage of development of the embryo. The chorion of the egg is quite transparent and, if the egg is fixed in Bouin's fluid, the embryo may be readily seen with the aid of a binocular dissecting microscope. In this way the main stages of development may be recognised. An analysis of these stages, as seen in the eggs of the 'berried' females caught during the different months, makes it possible to determine with reasonable accuracy the time and duration of spawning and also the rate of development and time of hatching of the embryo. Table VII shows the monthly totals of females 'in berry' and the stages of development of their eggs.

TABLE VII

Jasus lalandii

MONTHLY TOTALS OF 'BERRIED' FEMALES ANALYSED ACCORDING TO THE STAGES OF DEVELOPMENT OF THEIR EGGS

Stage of Development of Eggs	Number of Females Carrying Eggs at the Stage of Development Indicated in the First Column											
	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Morula	—	—	—	1	7	—	—	—	—	—	—	—
Blastopore formed	—	—	—	—	15	6	—	—	—	—	—	—
Germinal disc	—	—	—	—	12	11	2	—	—	—	—	—
Early nauplius	—	—	—	—	15	26	4	2	1	—	—	—
Maxillipeds formed	—	—	—	—	3	39	28	7	2	—	—	—
Median eye pigmented	—	—	—	—	3	16	23	15	2	—	—	—
Paired eyes pigmented	—	—	—	—	—	4	6	14	13	2	—	—
Ready to hatch	—	—	—	—	—	—	3	5	21	1	—	1
Monthly totals	—	—	—	1	55	102	66	43	39	3	0	1

The 'berried' female mentioned previously as being caught on 26th April carried eggs at the morula stage. Von Bonde (1936, p. 13) has shown that under artificial conditions this stage of development is reached after three days. It is therefore probable that the eggs were laid about 23rd April. From Table VII it is seen that three females taken in July carried eggs which were ready to hatch. Pigment spots were clearly visible on the pereiopods and the larvae were in the prenaupliosoma condition. The eggs had probably been laid in the preceding April. On this assumption the length of time from egg-laying to hatching is from three to four months. These observations are in agreement with those of Von Bonde and Marchand (1935, p. 14), who state that in aquarium experiments 'it was found that the female carried her eggs for about three to four months'.

After September there is a rapid falling off in the number of 'berried' females caught. During the five-year period only three females 'in berry' were taken in October, none in November, and one in December. From Table VII it is evident that, at Wedge Bay, laying takes place mainly during April, May, and June and hatching during July, August, and September.

Number of Eggs carried by Females in 'Berry'

In their work on *Jasus lalandii* in South Africa, Von Bonde and Marchand (1935, p. 11) state that the number of eggs carried by a female 'in berry' varies 'according to the female's size from 3000 to near 200,000'. In a later publication, however, Von Bonde (1936, p. 9) gives the number as varying from '3000 in the smallest to about 20,000 in the largest'. T. Challenger (1943, p. 52) states that an 'average specimen carried 850,000 eggs'. This estimate was based on a determination of the number of eggs carried by a female having a carapace-length of 5 inches (12·7 cms.). It is very doubtful whether a female of this size can be regarded as an average specimen. Apparently the determination was made on the eggs of only the one female. The method used is not fully described and the accuracy of the results obtained must therefore remain in doubt.

In the present investigation the number of eggs carried by a female 'in berry' was determined in the following way. The whole mass of eggs was carefully stripped from the pleopods and weighed. The eggs in two grammes of the mass were then counted. In six different specimens the numbers thus obtained were found to be 8500, 8780, 8350, 8340, 8320, and 8820 respectively, the average number being 8520. The number of eggs in one gramme was therefore about 4260. The number of eggs in the total weight of the egg-mass was then readily calculated. Table VIII gives a summary of the number of eggs carried by females whose carapace-length varied from 7·4 cms. to 12·4 cms.

TABLE VIII

Jasus lalandii

PRODUCTION OF EGGS

Length of Carapace in cms.	Smallest Number of Eggs	Largest Number of Eggs	Average Number of Eggs	Number of Crayfish Examined
7·4	—	—	68,650	1
7·8	65,170	116,080	90,730	7
8·0	110,330	132,060	121,410	3
8·2	109,110	129,930	119,520	2
8·4	107,560	170,610	136,740	10
8·6	115,740	169,120	140,150	8
8·8	69,430	164,860	127,370	5
9·0	93,500	217,430	146,300	9
9·2	136,320	242,820	198,090	6
9·4	143,130	230,040	189,570	15
9·6	156,010	324,180	232,170	12
9·8	193,830	251,340	222,370	4
10·0	143,130	338,240	236,000	12
10·2	172,100	367,640	249,210	18
10·4	180,200	295,640	260,710	11
10·6	247,080	325,460	286,700	6
10·8	215,550	309,270	269,080	4
11·0	227,910	413,220	308,420	8
11·2	248,360	319,500	283,720	2
11·4	276,470	328,020	302,030	2
11·9	323,760	393,620	358,690	2
12·4	—	—	339,590	1

An inspection of Table VIII will show that there is a tendency for the egg production of *Jasus lalandii* to obey the general law of fecundity, which Herrick (1895, p. 52) enunciated for the American lobster, *Homarus americanus*, and which he stated in the following form: 'The numbers of eggs produced by female lobsters at each reproductive period vary in geometrical series, while the lengths of the lobsters producing these eggs vary in an arithmetical series'.

NATURAL FOOD OF THE CRAYFISH

In nearly all the crayfish caught, an examination of the contents of the gut was made. Often the gut was empty or contained only the bait used in the 'pots'. However, in a number of cases the gastric-mill was filled with the remains of molluscs, other crayfish, crabs, echinoids, and sea-weeds. In some instances the molluscs could be identified from shell-fragments, which had not been completely disintegrated. One of the molluscs occurring most frequently in the gut-contents was the small *Cantharidus eximius* Perry, which is often found living on kelp. The common mussel, *Mytilus planulatus* Lamark, and a species of *Ischnochiton* were also sometimes present. Occasionally the gastric-mill contained the remains of other crayfish. In Table IX is given a monthly summary of the various foods found in the gut.

TABLE IX

Jasus lalandii

MONTHLY SUMMARY OF GUT-CONTENTS

(The figures represent the number of stomachs in which the various foods were found)

Food	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cantharidus eximius	—	1	2	—	20	25	8	1	2	2	3	7
Ischnochiton sp.	2	3	4	—	—	2	4	2	—	1	—	3
Mytilus planulatus	5	1	2	—	2	1	1	1	—	—	8	4
Other molluscs	7	19	2	4	2	24	15	10	6	—	4	9
Crabs	—	—	1	—	—	—	1	—	—	—	—	1
Crayfish	—	2	3	—	—	4	1	10	—	4	2	2
Echinoids	—	—	—	—	—	1	—	—	—	—	—	—
Sea-weeds	—	7	—	—	1	1	—	—	—	—	—	—

It will be noticed from Table IX that shells of *Cantharidus eximius* and other molluscs were found in the gut most frequently during May, June, and July. The catches of crayfish during these months contained a high proportion of females which had recently undergone ecdysis. The need for calcareous food for the strengthening and hardening of the new exoskeleton no doubt accounts for the frequent occurrence of shells in the gut.

Number of Marketable Crayfish

The regulations under the Fisheries Act, 1935, make it illegal to take crayfish having a carapace-length of less than 4¼ inches (10·8 cms.). It is also unlawful to take soft-shelled crayfish and females ' in berry '.

The specimens required for the present investigation were caught by the usual methods employed in the fishing industry. It is therefore instructive to note the proportion of the total catch that would have had to be returned to the sea if it had been necessary to comply with the regulations. The following list gives the numbers of crayfish of legal size and of those which, being undersized, soft-shelled, or ' in berry ', could not have been lawfully taken:—

Males of legal size and condition	185
Females of legal size and condition	31
Males undersized and/or soft-shelled	300
Females not ' in berry ' but undersized and/or soft-shelled	231
Females ' in berry '	310
Total	1057

It will be seen from the above list that, out of a total catch of 1057, only 185 males and 31 females could have been retained. The remaining crayfish, forming almost 80% of the total number caught, would have had to be returned to the sea.

Provided, therefore, that fishermen comply with the present regulations, there does not seem to be any danger of depleting the crayfish at Wedge Bay through over-fishing.

I desire to express my thanks to the Trustees of the John Ralston Bequest, under whose auspices the above research was carried out. I am also indebted to Colonel J. E. C. Lord, Chairman of the former Sea Fisheries Board, and Mr. E. P. Andrew-artha, Secretary to the Board, for help in obtaining the crayfish needed for the investigation. My thanks are also due to Dr. K. H. Barnard of the South African Museum for specimens of *Jasus lalandii* from South Africa. Valuable help in the laboratory was given by my former assistant, Mr. A. M. Olsen, and by Mr. J. W. Wyett. The crayfish were caught by Mr. G. L. Spaulding of Nubeena. The cost of collecting the specimens was defrayed by the Commonwealth Research Grant.

References

Challenger, T., 1943.—The Story of the Crayfish. *Tasmanian Journal of Agriculture*, Vol. XIV, No. 2, pp. 51-55.

Herrick, F. H., 1895.—The American Lobster. *Bull. U.S. Fish. Com.*, 15, pp. 1-252.

Hickman, V. V., 1945.—Some Abnormal Conditions of the Reproductive System of the Saltwater Crayfish. *Pap. Roy. Soc. Tasm.* 1944, pp. 57-59, Pls. VI and VII.

Von Bonde, C., and Marchand, J. M., 1935.—The Natural History and Utilization of the Cape Crawfish, Kreef or Spiny Lobster (*Jasus lalandii*). *Fish Bull. No.* 1, *Fish and Mar. Biol. Survey, S. Africa.*

Von Bonde, C., 1936.—The Reproduction, Embryology and Metamorphosis of the Cape Crawfish (*Jasus lalandii*). *Investigational Report*, No. 6. *Fish and Mar. Biol. Survey, S. Africa.*

A Description of *Sterrhurus macrorchis* n. sp., with Notes on the Taxonomy of the Genus *Sterrhurus* Looss (Trematoda—Hemiuridae)

By

Peter W. Crowcroft

(Demonstrator in Biology, University of Tasmania)

(Read 13th November, 1945)

Plates II-III

A specimen of the common 'Rock Cod' of Tasmanian waters (*Physiculus barbartus* Günther) was found to be infested with thirty trematodes which represent a new species of the genus *Sterrhurus* Looss. The worms were found in the stomach and pharynx. The stomach also contained a number of specimens of another Hemiurid, which appears to be *Parahemiurus australis* Woolcock, and which has not been previously reported from this host. The intestine and pyloric caeca of *Physiculus barbartus* are commonly infested with an unidentified tape-worm, and less frequently with an unidentified nematode. A further nine specimens of the host were examined for parasites, but no specimens of the trematode described in the present paper were found.

The 'in toto' mounts were fixed in alcohol under slight cover-glass pressure, and stained with alum-carmine. Specimens intended for sectioning were fixed in Bouin's solution. Transverse and longitudinal sections were cut at 6-10μ, and stained with Ehrlich's haematoxylin and eosin.

An examination of the literature dealing with the genus *Sterrhurus* shows that no satisfactory basis exists for separating *Sterrhurus* from the genus *Lecithochirium* Lühe. In the present paper it is proposed to separate the genera upon the basis of a fundamental difference in the structure of the terminal genital ducts.

Family HEMIURIDAE

Sub-family *Sterrhurinae*,

Sterrhurus macrorchis new species.

External features.—Stout, spindle-shaped trematodes, little or not at all, flattened dorso-ventrally. The type-specimen measures 2·9 mm. long, and 1·09 mm. wide under slight cover-glass pressure, and has the 'tail' or 'ecsoma' completely withdrawn (fig. 1). The 'tail' is capable of eversion to a length of approximately 0·5 mm., being poorly developed in comparison with that of most other members of the genus *Sterrhurus*.

The oral sucker is sub-terminal and directed ventrally. It measures 0·36 mm. in diameter and is bounded anteriorly by a narrow lip. The acetabulum is situated at about the posterior limit of the front half of the body. It is circular in outline and measures 0·57 mm. in diameter. The ratio in diameter between the acetabulum and the oral sucker in the type and paratypes varies from 1·5 to 1·6. Immediately in front of the acetabulum there is a deep transverse groove, the pre-acetabular pit. The common genital aperture is situated in the mid-line, half-way between the anterior extremity and anterior border of the acetabulum. The excretory aperture is at the extreme tip of the 'tail'. The cuticle is quite smooth and spineless. The extensive uterus, filled with orange-brown eggs, imparts a brownish appearance to the posterior half of the body, which elsewhere appears light-yellow.

Digestive System.—The cavity of the oral sucker opens directly into the pharynx, a prepharynx being absent. The musculature of the pharynx is quite independent of that of the oral sucker. The pharynx measures 0·16 mm. in diameter and is of approximately the same measurement in length. The pharynx opens through a strong sphincter into a short irregular chamber, the oesophagus, the wall of which is strongly muscular, possessing inner circular and outer longitudinal muscles. There is also a strong sphincter at the posterior end of the oesophagus separating it from the gut. From the oesophagus the gut rami run directly outward as smooth tubes for a distance of about 0·1 mm. This region and the oesophagus, pharynx and oral sucker are lined by a thin layer of the cuticle. In each ramus a weakly developed sphincter separates the proximal smooth region from a short expanded chamber, lined by an epithelium which bears dense strands which almost fill the lumen. This is the gland-stomach. The strands in other species have been described as protoplasmic threads, strands of mucus, and as cilia. The left and right gland-stomachs narrow and then expand into smooth sinuous tubes which extend backwards, near the dorsal surface, almost to the posterior extremity, occasionally entering the 'tail' for a short distance. Posterior to the gland-stomachs the rami are lined by columnar epithelial cells with basal nuclei. They possess a thin muscular wall consisting of inner circular and outer longitudinal fibres. The entire length of the gut is surrounded by a dense absorptive layer containing numerous nuclei, which is most developed in the vicinity of the oesophagus.

Excretory System.—The excretory vesicle extends from the excretory aperture to the level of the middle of the acetabulum as a thin-walled sinuous tube, which passes through the uterine coils, to the left of the ovary. At the anterior end, the ventral wall of the vesicle becomes raised in the mid-line, and further forward fuses with the dorsal wall, dividing the cavity into two approximately equal tubes. These paired vesicles diverge and come to lie near the lateral margins of the body. In this position they pass forwards to the level of the oral sucker, turn sharply inwards and fuse to form a continuous arc dorsal to the oral sucker.

When the 'tail' is withdrawn the posterior vesicle lies contorted in the uterine region and the excretory aperture opens into a chamber lined by the invaginated body wall. The excretory products escape through a posterior narrow ridged channel.

The surface of the entire excretory system is covered by minute spherical droplets, arranged singly, in short chains or in small aggregates. They are also present on the surface of the posterior chamber formed when the 'tail' is withdrawn and are apparently due to some excretory product.

Genital System, (1) *Male.*—The testes are two relatively large ovoid or roundly triangular bodies lying symmetrically near the lateral margins, slightly towards the dorsal surface, at about the middle length of the body. Their anterior border

is at the level of the middle of the acetabulum. They measure 0·4 mm. broad and 0·47-0·59 mm. long. The vasa deferentia leave the anterior borders of the testes and run forward obliquely to open together into the base of the large seminal vesicle. The vesicle is S-shaped and is divided into two regions, namely, (*a*) a large thin-walled posterior portion which is folded upon itself, and (*b*) a smaller anterior portion which has a thicker muscular wall composed of inner longitudinal and outer circular fibres, and which is connected to the posterior portion by a narrow neck. The anterior division connects with the pars-prostatica by a constricted muscular tube which terminates in a well-developed sphincter. The pars-prostatica has a muscular wall with a glandular lining of cubical empty-looking cells. It is tapered anteriorly and measures 0·16 mm. long, and near the posterior end 0·06 mm. in diameter. For the greater part of its length it is enclosed within the dorsal musculature of a large muscular sac, the so-called 'sinus-sac'. Anteriorly the pars-prostatica opens through the antero-dorsal wall of the sinus sac into a very large dorsal cavity within. The aperture is surrounded by a delicate nozzle or collar which projects into the cavity. The prostate gland extends over the entire antero-dorsal and postero-dorsal walls of the sinus sac and surrounds the pars-prostatica. The cells of the prostate gland are very large and vacuolate with prominent nuclei. The large sinus sac is ovoid in shape, having its long axis directed dorso-ventrally and measuring approximately 0·39 mm. x 0·21 mm.

The large dorsal cavity has its own wall. This is membranous and closely applied to the wall of the sinus sac dorsally. Ventrally and laterally there is a space between it and the sac wall filled by vacuolate spongy tissue. The wall of the expanded chamber is continuous with the ejaculatory duct and the musculature of the sac around the base of the small 'collar'. In the ventral floor of the expanded chamber there are distinct muscle fibres. A narrow pore leads through a muscular thickening of the floor into the cavity of the hermaphrodite duct at its junction with the female duct. The hermaphrodite duct is wide and highly muscular, having stout longitudinal muscles running from the body wall to the floor of the expanded chamber and inner circular muscles which project into the cavity. As the hermaphrodite duct is directed dorso-ventrally it does not extend posteriorly to the level of the common genital aperture as is the case in many other species of *Sterrhurus* (fig. 7).

(2) *Female.*—The ovary is a large, smooth, oval body lying immediately behind the right testis, slightly towards the dorsal surface. It measures 0·31 mm. x 0·42 mm. and has its long axis directed transversely. The largest ova in the ovary measure 0·008 mm. in diameter. The oviduct, the thin wall of which contains large flattened nuclei, leaves the ovary ventrally. On the right side it meets a duct which leads backwards into the receptaculum seminis. The oviduct passes ventrally a further 0·02 mm. and meets the short yolk duct. It then passes backwards as the ootype into the compact shell gland, turns upon itself, and passes directly forward to emerge anterior to the level of the origin of the oviduct. The tube expands slightly into the relatively narrow proximal portion of the uterus. This circumvents the shell gland and receptaculum seminis posteriorly and fills the body on the right side between the vitellaria. The uterus then passes backwards to fill the body posterior to them. The first loops of the uterus contain abundant sperms, indicating their function as a receptaculum seminis uterinum.

The shell gland and the receptaculum seminis are closely approximated into a compact organ between the ovary and vitellaria, the shell gland being antero-ventral and the receptaculum postero-dorsal. The shell gland contains dense gland cells arranged radially around the U-shaped ootype (fig. 6). The receptaculum seminis has an extensive cavity incompletely divided by thin partitions into four

or five compartments. In the four specimens sectioned the receptaculum was devoid of contents. The single pair of vitellaria lie near the dextro-ventral surface. Each is deeply cleft into three blunt expanded lobes. The yolk ducts arise near the inner borders of the vitellaria, converge sharply and unite to form a very short common yolk duct. The yolk cells measure as much as 0·012 mm. in diameter. The extensive coils of the uterus occupy the body space behind and to the left of the vitellaria and passing forwards fill the space between the testes. In extended specimens the posterior uterine coils may enter the base of the 'tail'. The innumerable uterine eggs are long-oval in shape, measuring 0·02-0·024 mm. long and 0·008-0·01 mm. broad and are orange-brown in colour. At the level of the hind edge of the acetabulum the wall of the uterus, which is membranous and contains flattened nuclei, abruptly narrows and becomes muscular, possessing outer longitudinal and inner circular fibres. This narrow muscular portion measuring approximately 0·01 mm. in length expands into a thin-walled tube of the same length, which abruptly narrows and passes into the metraterm. The metraterm is highly muscular and, in addition to the outer longitudinal and inner circular muscles, has a lining of cuticle. Anteriorly it penetrates the wall of the muscular sac and passes forward immediately below the thin-walled dorsal chamber. Directly below the male aperture in the floor of this chamber it passes into the short broad hermaphrodite duct.

The metraterm is divided into two portions by a constriction at the level of the middle of the acetabulum. In the contracted state the distal muscular and thin-walled portions of the uterus and the proximal portion of the metraterm are coiled into a compressed helix.

Muscular System.—The oral sucker and the acetabulum present no unusual features. They possess the normal equatorial meridonial and radial muscles. The body-wall is composed of the usual circular, longitudinal, and oblique muscles. It is highly muscular in the 'neck' region, but behind the acetabulum the musculature is weak. Throughout the body-length, the ventral body-wall is the more muscular. In addition to the posterior oblique retractor muscles of the oral sucker there are a few very large hollow fibres, derived from the longitudinal muscles of the dorsal body wall, which curve forwards and downwards and are inserted in the antero-dorsal wall of the sucker. Weak oblique muscles run forwards and downwards from the dorsal body wall to the pre-acetabular pit.

Nervous System.—The nerve ganglia are situated on either side of the anterior portion of the pharynx. Ganglion cells are numerous near their dorsal periphery. The dorsal nerve commissure bends slightly forwards and lies above the oral sucker, while the ventral commissure bends backwards and lies beneath the oesophagus, giving off nerves to the anterior regions of the gut. Ventrally the ganglia give off two slender nerves which run forwards and downwards to supply the pre-oral lip and the oral sucker. Posteriorly the ganglia are continuous with the paired lateral nerves which diverge and pass downwards to lie near the ventral surface. These lateral nerves were traced as far as the level of the genital aperture.

Host.—Physiculus barbartus Günther.

Location in Host.—Pharynx and stomach.

Frequency.—Present in one of ten hosts examined. Host obtained from Hobart Fish Market, October, 1944.

The Structure of the Terminal Genital Ducts in the Genus Sterrhurus Looss

Looss (1907*a*) in his diagnosis of the genus *Sterrhurus* remarks of the terminal genital ducts, 'Der den Cirrusbeutel ersetzende Muskelsack hat birnformige Gestalt,

und umschliesst ausser dem Ductus ejaculatorius, auch den Anfangsteil des Metraterms und den kurzen Ductus ejaculatorius, dessen Endabschnitt zu einem kugelformigen Hohlraum erweitert ist. In diesen tritt von hinten her die ausserhalb des Beutels gelegene Pars prostatica wobei ihr innerer Belag lippenartig in den Hohlraum der Blase vorspringt. Oft setzen sich die Secretmassen auch mehr oder minder weit auf die Wand der Blase fort.' Looss includes in the genus the following species, *S. musculus, S. imocavus, S. grandiporus* (Rud.), and *S. fusiformis* (Lühe). In an extended account of the type species (*S. musculus*) Looss (1907*b*) states his conviction that the cavity or bladder within the cirrus sac represents an expanded portion of the ejaculatory duct. He says 'Der männliche Leitungsweg, der nach seinem Austritt aus dem Ductus hermaphroditicus als Aquivalent eines Ductus ejaculatorius betrachtet werden kann, erweitert sich nach kurzem Verlauf unvermittelt zu der mehrfach erwähnten Blase, deren Vorhandensein anscheinend die birnförmige Gestalt des Cirrussacks bedingt. Ihr innere Auskleidung ist ohne Zweifel eine stark verdünnte, aber direkte Fortsetzung der Auskleidung des Ductus ejaculatorius, denn man sicht beide kontinuierlich ineinander Ubergehen; eine aussere Muskelauflagerung scheint der Blase zu fehlen'. Looss also states that the pars-prostatica projects into the expanded bladder like the opening of the womb, and that the wall of the expanded portion of the ejaculatory duct is covered with droplets of prostatic secretion in most of his specimens, but in some is free from these, and the bladder filled with groups of spermatozoa.

Linton (1910), briefly describes *S. monticelli* and records some specimens of *S. fusiformis* (Lühe). The detailed structure of the terminal genital ducts is not given, but an illustration of a longitudinal section through the fore-body of *S. monticelli* shows a large 'cirrus' projecting into the common genital duct. Linton's figure of longitudinal section through the fore-body of the *S. fusiformis* shows the expanded bladder within the dorsal end of the cirrus sac lined by tall cells and labelled 'duct of prostate'.

Nicoll (1915) describes *S. brevicirrus* and states that a 'prostate vesicle' is present at the base of the cirrus sac. A detailed account of the species is not given, but Nicoll remarks that his species displays all the typical features of the genus *Sterrhurus* Looss.

Manter (1934) describes *S. laevis, S. floridensis, S. robustus, S. profundus*, and *S. praeclarus*. In *S. laevis* the cirrus or sinus sac is described as short and very broad and mostly occupied by the 'prostate vesicle' which is itself almost filled by the tall cells which line its wall. In this species the seminal vesicle is conspicuously divided into two parts, one of which is anterior and the other usually posterior to the ventral sucker. In *S. floridensis* there is a spherical 'prostate vesicle' within the base of a clavate cirrus sac. The vesicle is shown to be lined by tall cells similar to those usually lining the pars prostatica, and the metraterm meets the male duct immediately in front of the vesicle, forming a long, sinuous ductus hermaphroditicus. *S. praeclarus* differs from perviously described species in that the cirrus sac is much reduced and the metraterm meets the male duct at the anterior end of the pars prostatica which is near the genital pore. In *S. robustus* the cirrus sac or sinus sac is totally lacking, the ejaculatory duct and ductus hermaphroditicus being simply tubular in form. Manter describes the prostate gland as lying free around the prostate vesicle and shows the seminal vesicle lying mainly behind the acetabulum and conspicuously constricted into two parts. He remarks that *S. profundus* presents so many peculiarities that it might warrant the formation of a new genus; and in his specific diagnosis states 'Genital atrium very short; ejaculatory duct long, narrow, straight or slightly sinuous, widening opposite the pharynx to form a thick-walled prostate vesicle'. *S. profundus* differs from all previously described species

in that the seminal vesicle is undivided, the genital pore far anterior, etc. Manter states that as it is difficult to arrive at a logical generic limitation, at the time he prefers to place this species in the genus *Sterrhurus*. In none of the species of *Sterrhurus* described by Manter is there present any structure projecting into the cavity of the prostate vesicle as described by Looss.

Yamaguti (1934) describes *S. inimici*, and puts forward a new interpretation of the terminal portions of the genital ducts. He regards the expanded bladder at the base of the 'sinus sac' as a greatly expanded ductus hermaphroditicus. Since Yamaguti (1938) rescinds this interpretation after further examination of the specimens, it need not be elaborated further. Stunkard and Nigrelli (1934) describe *S. branchialis*. The copulatory organs and 'sinus sac' of this species agree with those of *S. musculus* Looss, except that the ductus hermaphroditicus is somewhat longer. These authors express the view that *S. praeclarus*, *S. robustus*, and *S. profundus* of Manter should not be included in the genus *Sterrhurus* Looss, but do not attempt to re-classify these species. Stunkard and Nigrelli express the view that the ductus hermaphroditicus is undoubtedly formed 'by fusion of the distal parts of the metraterm and ejaculatory duct'.

Park (1936) states that Looss refers to the vesicle at the base of the 'sinus sac' as 'merely the vesicular expansion between the pars prostatica and the ductus hermaphroditicus'. However, as shown above, Looss expresses the definite opinion that this vesicle represents an expanded portion of the ejaculatory duct. In *S. magnatestis* Park the pars prostatica projects into the 'prostate vesicle' within the 'sinus sac' (or cirrus sac) in the same manner as in *S. musculus* Looss, but it bears at its innermost extremity a nozzle or collar which, according to Park, is covered with minute spinules. Park regards this nozzle as representing a copulatory organ or true cirrus and designates the expanded portion of the male duct into which it projects a 'cirrus vesicle'. In view of the muscular nature of the 'sinus sac' and 'cirrus vesicle' Park predicts that the 'cirrus' may be protusible at the time of copulation. The aperture connecting the 'cirrus vesicle' with the hermaphrodite duct is regarded as representing a very short ejaculatory duct. Park remarks 'However this is not a true one in origin, although it may be functioning as such in those species lacking a cirrus. It is probable that the duct is derived from a modification of the anterior part of the cirrus sac'. Park considers that in his species the true ejaculatory duct is lacking or has become a part of the 'cirrus', and that on this account Stunkard and Nigrelli's statement that the hermaphrodite duct is formed by the fusion of the distal parts of metraterm and ejaculatory duct might need modification. Park considers that the hermaphrodite duct or genital sinus might rather be formed by invagination and elongation of the genital atrium in development, since the structure of the muscular vesicle shows 'a possible modification of the cirrus sac which contains a cirrus. Under this assumption the muscular vesicle is homologous with the cirrus sac or part of it. Therefore the name cirrus vesicle is preferable to prostate vesicle from the evolutionary point of view'.

Yamaguti (1938) describes *S. musigarei* and *S. magnus*. In *S. musigarei* two-thirds of the pars-prostatica projects through the wall of the 'sinus sac' into the cavity within the dorsal end of the sac. As this chamber is regarded as an expansion of the ejaculatory duct and discharges sperms into the hermaphrodite duct upon the contraction of the 'sinus sac', Yamaguti prefers the term 'ejaculatory vesicle' to 'prostate vesicle'. The pars-prostatica bears at its extremity a thin nozzle similar to the 'cirrus' of Park. The ejaculatory vesicle opens anteriorly into a short, wide hermaphrodite duct. In *S. magnus* the genital end-organs are of

similar construction. Yamaguti points out that *S. robustus* Manter should be transferred to *Dinosoma*. A year later Yamaguti (1939) describes a further species, *S. pagrosomi*, in which the pars prostatica is enclosed anteriorly in the dorsal wall of the 'ejaculatory vesicle'. The metraterm is described as running forwards along the ventral wall of the 'ejaculatory vesicle' and opening at its anterior end into the ductus hermaphroditicus. Jones (1943) re-describes *Sterrhurus fusiformis* (Lühe) in detail. The 'prostate vesicle' at the base of the 'sinus sac' is lined by large vacuolate cells similar to those lining the pars-prostatica. The prostate vesicle and the pars-prostatica are directly continuous, there being no inwardly projecting portion of the latter into the cavity.

In *S. macrorchis*, described above, the terminal genital organs correspond essentially to Yamaguti's description of *S. pagrosomi*, but resemble those of *S. magnatestis* in the possession of the collar, nozzle, or 'cirrus' of Park, which does not appear to be present in *S. pagrosomi*.

The above accounts of the terminal genital ducts of *Sterrhurus* species indicate that the expanded vesicle within the muscular pouch has arisen in two different ways. The organs of some species are adequately described by Looss' original diagnosis of the genus. These species possess a vesicular expansion of the ejaculatory duct, into which the terminal portion of the pars-prostatica may project, and which connects with the hermaphrodite duct by an unexpanded portion of the ejaculatory duct which may be more or less abbreviated. In view of the origin and function of the expanded vesicle in these species the term 'ejaculatory vesicle' proposed by Yamaguti should be applied to it. A gradual encroachment of the pars prostatica into the cavity of the ejaculatory vesicle is seen to have taken place. In *S. macrorchis* the anterior portion of the pars prostatica, while enclosed within the musculature of the 'sinus sac', yet does not project into the cavity of the ejaculatory vesicle (fig. 7). In *S. musculus* Looss, *S. branchialis* Stunk. et Nig. (fig. 5), *S. magnatestis* Park (fig. 3), and *S. inimici* Yamaguti, the pars projects a short distance into the vesicle. A further stage has been reached in *S. musigarei* Yamaguti and *S. magnus* Yamaguti in which as much as two-thirds of the entire length of the pars may project into the ejaculatory vesicle (fig. 4). The 'cirrus' of Park appears to be constantly present in some species and in *S. macrorchis*, at least, is not the copulatory organ. It is possible that the terminal genital organs have arisen in different ways in *Sterrhurus* species, but as this seems unlikely, Park's term 'cirrus vesicle' is not suitable.

In *S. fusiformis* (Lühe) (fig. 10), *S. floridensis* Manter (fig. 8), and *S. laevis* Manter, the expanded vesicle within the muscular pouch appears to have arisen by expansion of a portion of the pars prostatica. The vesicle is lined by a continuation of the lining of the pars prostatica, and the free part of the pars is directly continuous with the vesicle, there being no projection into the vesicle. The question arises as to whether these species should be included in the genus *Sterrhurus*. An indication of their true systematic position follows from a consideration of the structure of the terminal genital organs in the genus *Lecithochirium* (Lühe).

The Terminal Genital Organs of Lecithochirium.

Looss (1907*b*) re-defines the genus and includes two species, *L. rufoviride* (Rudolphi) and *L. gravidum* which has previously not been separated from the former. These two species are very similar, differing only in size, proportion, and size of suckers, etc. Looss states that the structure of the terminal ducts in the genus is essentially similar to that found in the genus *Sterrhurus*. The genus *Lecithochirium* is distinguished from *Sterrhurus* principally because of morphological differences in the fore-body. *L. rufoviride* (Lühe) and *L. gravidum* Looss possess

a pair of prominent muscular thickenings in the ventral wall of the oral sucker, which is preceded by a well-developed pre-oral lip or lappet, only weakly developed in the *Sterrhurus* species recognised by Looss. *Lecithochirium* is also distinguished by the presence of a pre-acetubular pit or groove.

Further species have been assigned to the genus, which have the pre-oral lip developed to a more or less degree, and none of which possess the muscular thickenings of the oral sucker. The terminal genital ducts of those species added to the genus since 1907 and which have been described in detail, have been essentially similar to those of *S. floridensis*, *S. laevis*, and *S. fusiformis* (according to Jones' re-description). Workers on the group have applied various terms to these structures. Chandler (1935), in his description of *L. microstomum*, states that the prostatic portion of the vas deferens was sac-like and constricted into two parts where it penetrated the sinus-sac (fig. 9). Yamaguti (1938) takes the view that the pars-prostatica is divisible into two parts. He proposes the use of the term 'prostatic vesicle' for the expanded portion within the sinus-sac. Manter (1940) adopts the term 'prostate vesicle' for the prostatic portion of the male duct, whether enclosed within the sinus-sac or free from it. Thus in species of *Lecithochirium* Manter refers to 'internal' and 'external' prostate vesicles. I concur with Yamaguti's proposal.

As Jones (1943) points out the present separation of the genera *Sterrhurus* and *Lecithochirium* is unsatisfactory as the genus *Sterrhurus* is defined upon negative features which for the most part are really only differences of degree. It can be seen that two fundamentally different types of terminal genital organs are present in the two genera. In all the adequately described species of *Lecithochirium* the bladder within the muscular pouch or sinus-sac is a portion of the pars prostatica. All those species in which the bladder is derived from a portion of the ejaculatory duct are included in the genus *Sterrhurus* but several species in which the bladder represents a portion of the pars prostatica have been included in this genus, namely, *S. fusiformis*, *S. floridensis*, and *S. laevis*. If the difference in structure of the terminal genital ducts is adopted as a means of distinguishing the genera, many anomalies pointed out by Jones disappear. *S. fusiformis* (Lühe), *S. floridensis* Manter, and *S. laevis* Manter are accordingly, transferred to the genus *Lecithochirium* (Lühe). Until adequate detailed descriptions of *S. brevicirrus* and *S. monticelli* appear their position is uncertain. However, from the descriptions available, the former appears to be correctly assigned, but the latter should be transferred to *Lecithochirium*. *S. robustus* Manter has been transferred to the genus *Dinosoma* Manter by Yamaguti (1938). *S. praeclarus* Manter and *S. profundus* Manter differ so markedly from the members of either genus that new genera should be set up to accommodate them.

This paper was prepared whilst in receipt of a Commonwealth research grant. I should like to express my thanks to Prof. V. V. Hickman for his advice.

References

Chandler, A. C., 1935.—Parasites of Fishes in Galveston Bay. *Proc. U.S. Nat. Mus. Washington.* 83, pp. 127-128, pl. 6.

Jones, D. O., 1943.—The Anatomy of Three Digenetic Trematodes, *Skrjabiniella aculeatus* (Ohdner), *Lecithochirium rufoviride* (Rud.) and *Sterrhurus fusiformis* (Lühe), from *Conger conger* (Linn.). *Parasitology Cambridge*, 35, pp. 47-57.

Linton, E., 1910.—Helminth Fauna of the Dry Tortugas, 2, Trematodes. *Carnegie Inst. Wash. Publ.* No. 133, pp. 61-63, pl. 17-18.

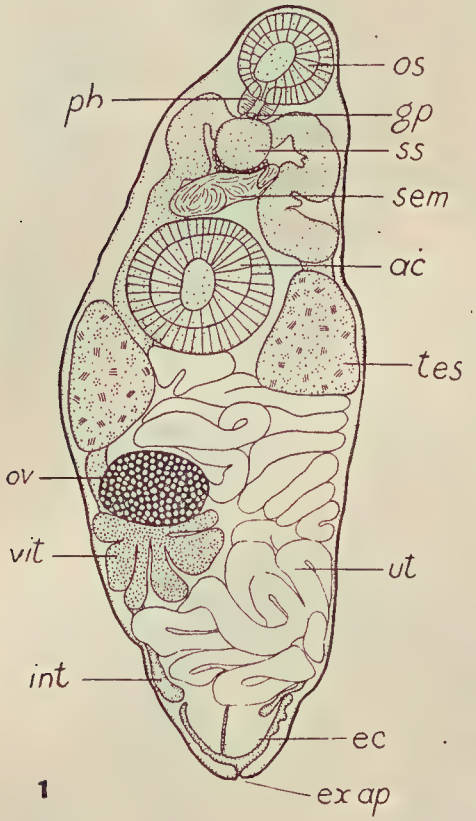
LOOSS, A., 1907*a*.—Zur Kenntniss der Distomenfamilie Hemiuridae. *Zool. Anz. Leipzig.* 31, p. 600.
————, 1907*b*.—Beitrage zur Systematik der Distomen. *Zool. Jahrb., Abt. System.*, 26. pp. 139-141, Taf. 12-13.
MANTER, H. W., 1934.—Some Digenetic Trematodes from Deep-water Fishes of Tortugas, Florida. *Carnegie Inst. Wash. Publ.* No. 435, pp. 305-312, pl. 11-13.
————————, 1940.—Digenetic Trematodes from the Galapagos Islands and the Neighboring Pacific. *Report Alan Hancock Pacific Exped.* 1940, pp. 426-429, pl. 47.
NICOLL, W., 1915.—Trematodes of North Queensland. III, Parasites of Fishes. *Parasitology Cambridge.* 8 (1), pp. 32-33, pl. IV.
PARK, J. T., 1936.—Two New Trematodes, *Sterrhurus magnatestis* and *Tubulovesicula californica* (Hemiuridae) from Littoral Fishes of Dillon's Beach, California. *Trans. Amer. Micros. Soc.* 55. pp. 477-481, pl. LX.
STUNKARD, H. W., AND NIGRELLI, R. F., 1934.—Observations on the Genus *Sterrhurus* Looss, with a Description of *Sterrhurus branchialis* sp. nov. (Trematoda-Hemiuridae). *Biol. Bull.* 68 (3), pp. 535-543.
YAMGUTI, S., 1934.—Studies on the Helminth Fauna of Japan 2. Trematodes of Fishes I. *Jap. Journ. Zool.* 5 (3), pp. 444-445.
————————, 1938.—Studies on the Helminth Fauna of Japan 21. Trematodes of Fishes IV. (Revised) Pub. by the Author, (Maruzen. Tok.) pp. 120-121, 128-130.
————————, 1939.—Studies on the Helminth Fauna of Japan 26. Trematodes of Fishes VI. *Jap. Journ. Zool.* 8, pp. 226-227, pl. 29.

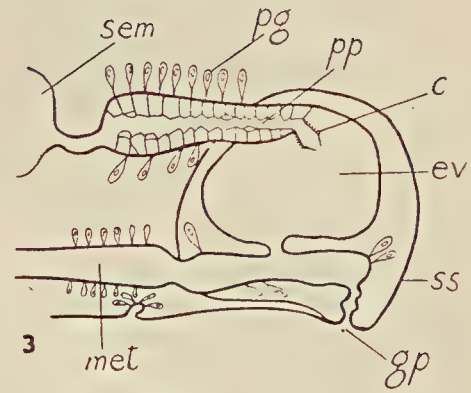
PLATE II

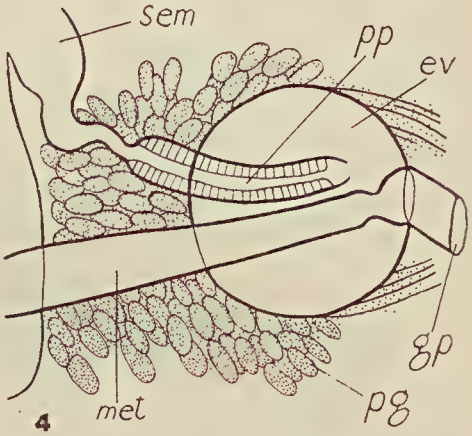
FIG. 1.—*Sterrhurus macrorchis* n. sp., whole mount from the ventral aspect.
FIG. 2.—*Sterrhurus macrorchis* n. sp., transverse section at the level of the testes.
FIG. 3.—*S. magnatestis* Park, terminal genital organs, after Park.
FIG. 4.—*S. musigarei* Yamaguti, terminal genital organs, after Yamaguti.
FIG. 5.—*S. branchialis* Stunk. & Nig., terminal genital organs, after Stunkard and Nigrelli.

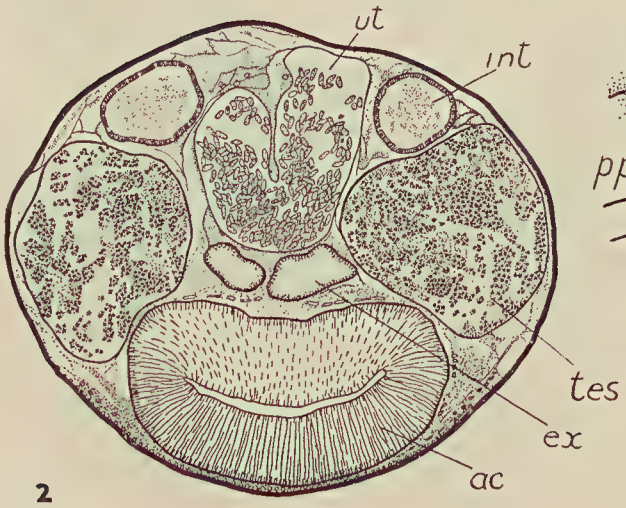
ABBREVIATIONS USED IN PLATES

ac. acetabulum, *c.* cirrus, *ec.* ecsoma, *ev.* ejaculatory vesicle, *ex.* excretory vesicle, *ex ap.* excretory aperture, *gp.* common genital pore, *hd.* hermaphrodite duct, *int.* intestine, *met.* metraterm, *oo.* ootype, *os.* oral sucker, *ov.* ovary, *pg.* prostate gland, *ph.* pharynx, *pp.* pars-prostatica, *pv.* prostate vesicle, *rs.* receptaculum seminis, *sem.* seminal vesicle, *sh.* shell gland, *ss.* sinus-sac, *tes.* testis, *ut.* uterus, *vit.* vitellaria.


os
ph
gp
ss
sem
ac
tes
ov
vit
ut
int
ec
ex ap
1


sem
pg
pp
c
ev
ss
met
gp
3


sem
pp
ev
gp
met
pg
4


ut
int
tes
ex
ac
2

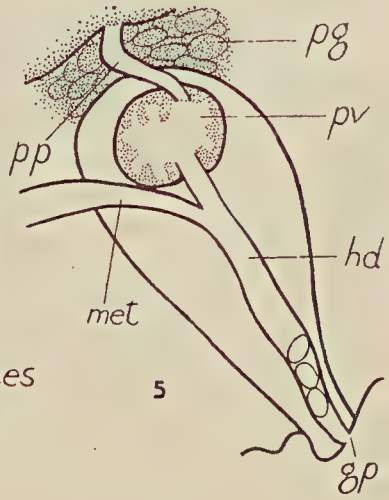

pg
pv
pp
hd
met
5
gp

PLATE III

FIG. 6.—*Sterrhurus macrorchis* n. sp., transverse section through the female complex.

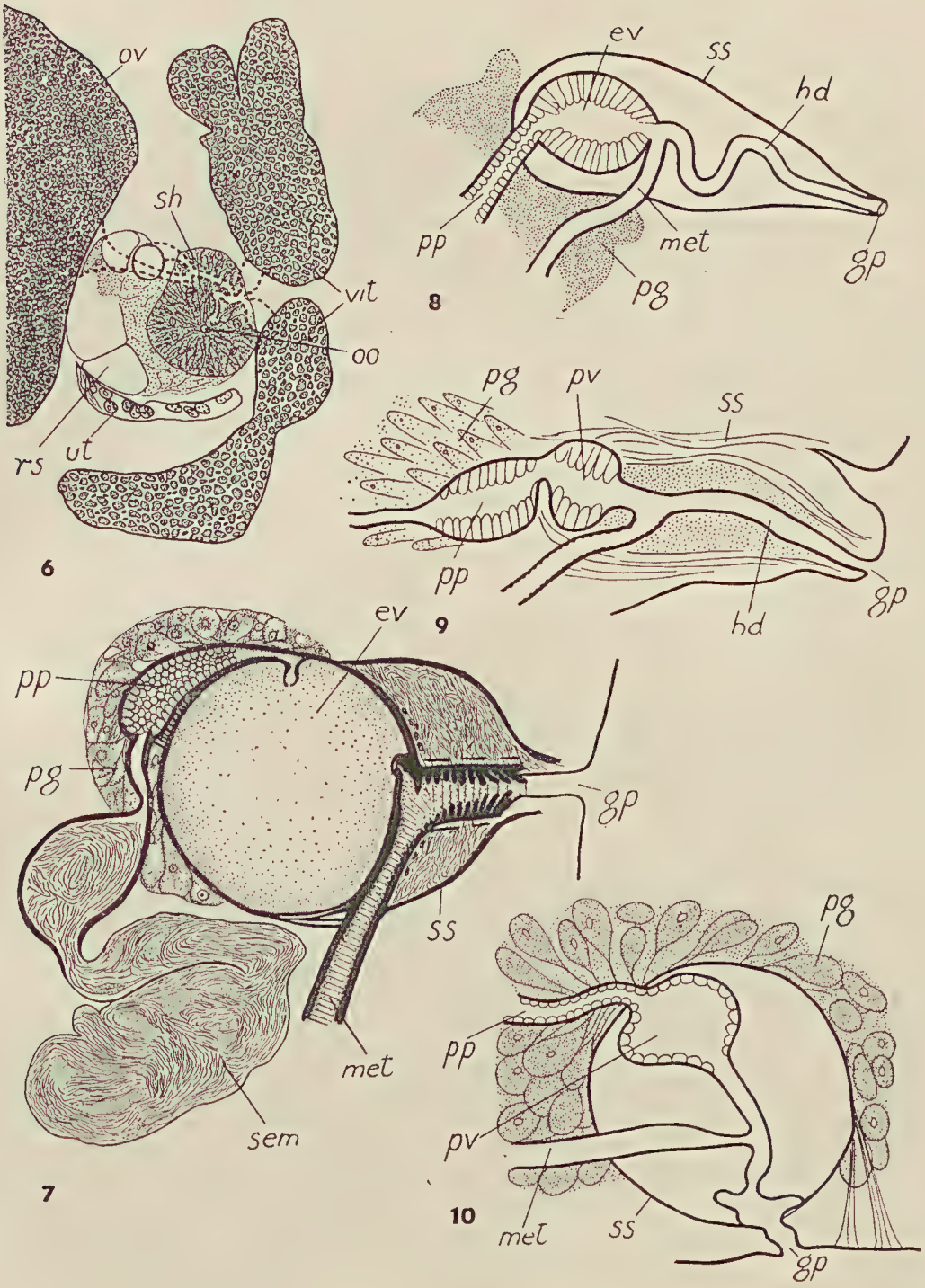
FIG. 7.—*Sterrhurus macrorchis* n. sp., sagittal section through the terminal genital organs.

FIG. 8.—*Lecithochirium floridense* n. comb. (*Sterrhurus floridensis* Manter), terminal genital organs, after Manter.

FIG. 9.—*Lecithochirium microstomum* Chandler, terminal genital organs, after Chandler.

FIG. 10.—*Lecithochirium fusiforme* Lühe (*Sterrhurus fusiformis* Lühe), terminal genital organs, after Manter.

For explanation of abbreviations see page opposite Plate II.


ov
sh
vit
oo
rs
ut
6
ev
ss
hd
pp
met
gp
pg
8
pg
pv
ss
pp
gp
hd
9
ev
pp
pg
gp
ss
met
sem
7
pg
pp
pv
met
ss
gp
10

Notes on the Lepidoptera-Rhopalocera of Tasmania

By

L. E. Couchman

(Read 13th November, 1945)

The Tasmanian butterfly fauna is numerically poor. Turner (1926, 1939) lists 35 species, of which one, *O. laranda* Waterhouse and Lyell is generally accepted as the western race of *O. lathoniella* Westwood, the two species of Pieridae and the one Danaid recorded are casual immigrants only, while the records of two Hesperidae are exceedingly doubtful.

Excluding Flinders Island, the purely Tasmanian list numbers certainly no more than thirty species, including the introduced pest of our gardens, *Pieris rapae* Linn.

The relatively few species, however, offer some fascinating problems in distribution, racial and individual variation, and there is still much work to be done in these fields.

Dr. Turner's reference to the paucity of resident collectors still remains true, but four years residence has enabled me to add a number of details that will contribute to the Biological Survey of Tasmania, and I have been helped by the enthusiastic co-operation of Messrs. S. Angel and J. R. Cunningham.

Nesoxenica leprea leprea Hewitson, 1864

The typical race was described from 'Australia' by Hewitson, his specimens almost certainly came from Mt. Wellington, at an altitude of about 2500 feet, the only recorded locality to date.

The bush fires of 1939-1940 seemed to have exterminated it, since a prolonged search in 1942-43 failed to turn up a specimen. However, in 1943-44 a single specimen was seen and taken, and in 1944-45 a small series was secured, so that *leprea* seemed on the way to re-establishing itself in its original locality, but the recent disastrous fires would seem to have left it small chance of survival.

In January, 1945, in an effort to find other localities, a search was made in the National Park district, and in a restricted area four miles from Lake Dobson, at an altitude of c. 2000 feet a few specimens were taken. These seem indistinguishable from the typical Mt. Wellington form, though the amount of material is perhaps too small for certain judgment.

This new record extends the range of *l. leprea* westwards nearly forty miles, it would seem probable that this form may also be found in suitable localities between these two places.

N. leprea elia Waterhouse and Lyell, 1914

This, the western race of *leprea*, was originally described from 'Mt. Magnet, Mt. Dundas'. Hardy (1917) as '*Neoxenica leprea*' recorded *elia* from Cradle Mt., correcting the record to *elia* a year later.

Turner (1926), under '*leprea*', added further records from Moina, 2000 feet; later (1939) corrected the locality to 'Daisy Dell' on the Cradle Mt.-road at 2000 feet.

When during the summer of 1944-45 an effort was made to locate in the Lake St. Clair area some of the species hitherto only recorded from Cradle Mt., *elia* was one of the species I secured.

N. l. elia was found over a wide area, from Cynthia Bay at the southern end of the lake, through the Narcissus River valley, and in Pine Valley. A careful search showed that it extends over a considerable range in altitude, specimens were taken at lake level, 2360 feet, and the insect traced up the slopes of Mt. Rufus to a height of 3800 feet, to the limit, in fact, of the *Fagus cunninghamii* belt.

Both *l. leprea* and *l. elia*, so far as we have found them, only occur in localities near *Fagus cunninghamii* Hooker, the Tasmanian 'Myrtle'; an association noted by previous authors, though it is most unlikely that the larvae feed on the Myrtle; as with other Satyridae the early stages will almost certainly be found on grasses.

With these extensions in the geographical range of the two sub-species, the gap between *l. leprea* at National Park and *l. elia* at Lake St. Clair is little more than forty miles, and the existence of an intermediate form linking the western *elia* with the eastern *leprea* would seem impossible, though the exact division between the forms has still to be discovered.

Argynnina hobartia Westwood, 1851

As with several other Tasmanian species, the published information regarding *hobartia* is misleading, evidently because of the few resident collectors able to note the first appearance and the length of time during which the species is on the wing.

Waterhouse (1932) says of *hobartia:* 'Not common . . . . November is the best month to search for it, although it has been recorded during December and January'.

Actually, *hobartia* is one of the commonest of the early spring butterflies in the gullies and hillsides around Hobart. I have records ranging from October 5th to November 7th, the earliest female noted, October 7th; S. Angel has specimens from Lindisfarne dated October 5th to October 22nd; and J. R. Cunningham has taken males at Kingston on September 28th.

From observations in these localities over a period of four years, I find *hobartia* is fully out during the second and third weeks in October, by the end of the month it is definitely going over, and from November onwards is certainly rare.

Oreixenica orichora flynni Hardy, 1917

Hitherto the only recorded locality for this Tasmanian sub-species has been Cradle Mt., at a height of c. 3000 feet.

A close search in the Lake St. Clair district proved that *flynni* has an extended range, a few specimens were taken in the Narcissus River valley at c. 2400 feet, on January 19th, 1945.

The form taken is apparently identical with that from the northern end of the Mountain Reserve.

Geitoneura Butler, 1867

Ann. Mag. nat. Hist. (3) 19: 164-165. (= *Xenica* auct. nec Westwood 1851)

For more than fifty years the generic name *Xenica* has been used to include, among others, the common Tasmanian species described as *Satyrus klugii* by Guérin-Méneville [1830-31].

Waterhouse and Lyell (1914) restricted *Xenica* to three species, *Papilio acantha* Donovan 1805; *Satyrus klugii* Guérin-Mén. [1830-31]; and *Xenica minyas* W. & L. 1914; with *acantha* Don. as the genotype; this usage has been generally accepted by authors.(1)

Hemming (1941, J. Soc. Bibliogr. nat. Hist. Lon. 1: 419-420) drew attention to the fact that the genotype of *Xenica* is *Papilio abeona* Donovan 1805, and that *Xenica* Westwood 1851 therefore falls to *Tisiphone* Hubner 1818, which has for its genotype the same species.

Semper (1878) in the J. Mus. Godeffroy Hamburg 5 (14): 144, seems to have been the only author dealing with the Australian species to have correctly placed these genera, he uses *Xenica* Westwood solely for *abeona* Don., and places *acantha* and *klugii* under *Geitoneura* Butler, these being the only two species included in the genus by Butler when describing it in 1867.

Geitoneura Butler, with genotype *Satyrus klugii* Guérin-Mén., the first of the two species included by Butler, must take the place of *Xenica*, so long used for this group of Satyridae.

The generic title *Xenica* has become so familiar that the change, though necessary, seems regrettable.

Hesperilla chaostola Meyrick, 1888

This species has always been accounted rare, the initial specimen, a single male, was described from Blackheath, N.S.W.; the first female, described many years later by Lower, came from Huonville, again a single specimen.

Dr. Waterhouse, *in litt.*, noted that the Tasmanian form was distinct, but had only one poor male from Tasmania. My own experience, after a close search of several localities extending over three seasons, seemed to confirm its rarity, since I had but one perfect male taken 7-XI-42; and one ragged female, 21-XI-43, both from Hobart; few other specimens were then known.

During 1944 J. R. Cunningham found this species near Kingston, and during November, 1945, together with S. Angel and myself, sufficient specimens were taken to confirm the suggestion that the Tasmanian form is, in fact, distinct.

Hesperilla chaostola leucophaea, n. sub-sp.

Male upperside: forewing, brown, cell spot 1·5 mm. square, yellowish, three sub-apicals, a discal spot in area 3, and sub-terminal spots in 4 and 5, yellowish-white, hyaline. Sex mark from dorsum to vein 3, black; cilia grey-brown, at veins brown.

Hindwing brown, a broad central patch divided by veins 3 and 4 dull orange, a few sub-terminal indistinct scales of the same colour. Cilia grey, at the veins brown.

Underside, apex of forewing and the hindwing whitish-grey, hyaline spots of forewing as above, the sub-apical and sub-terminal spots white, cell spot extending

(1) In reference to the specific names *klugii* and *acantha*, frequently emended by authors, I am indebted to A. J. Musgrave, F.R.E.S., who kindly consulted the original references, and confirms the spelling here used.

to base, orange, discal spots in 1*a*, 2 and 3, yellow. Hindwing with obscure brown rings, in cell, near base of area 7, and a discal series from 1*a* to 7.

Female upperside as in male, with addition of hyaline spots in discal area of 1*a* and 2 of forewing, the latter being the largest, 2·5 mm. broad. Hindwing as in male. Underside as in male, the orange cell spot of forewing joined to spot in area 2.

Holotype male, labelled ' Kingston, Tas. 5th Nov. 1945. J. R. Cunningham.'

Allotype female, ' Kingston, Tas. 5th Nov. 1945. J. R. Cunningham.' in the Tasmanian Museum, four male (Kingston, Tasm. 10-XI-45. L. E. Couchman Hobart, Tasm. 7-XI-42. L. E. Couchman) and three female (Kingston, Tasm. 10-XI-45. L. E. Couchman) paratypes in my own collection, one male paratype, (Kingston, Tasm. 10-XI-45. L. E. Couchman) lodged in the Australian Museum, Sydney.

The distinctive whitish-grey coloration of the apex of forewing, and the hindwing beneath, is noted in the racial name suggested by Professor J. R. Elliott.

In worn specimens the hindwing beneath becomes brownish, but the apex of the forewing retains its distinctive tint.

This Tasmanian race, hitherto considered so rare, is extremely local, but proves to be not uncommon, since S. Angel notes eleven males and four females taken November 11th, 1945, from Kingston. In addition, there is a worn male dated 25-XI-45, from Bicheno in coll. S. Angel.

Anisynta dominula Plötz 1884

This species was described by Plötz from a male from Tasmania, though there is no clue as to the exact locality from whence it came. Plötz made no collection, but sketched every butterfly he described in a series of plates that were never published.

Seitz (1927) in vol. 9, Macrolepidoptera of the World, has undoubtedly used many of the MS. figures of Plötz, and on plate 168*b* (8, 9) and plate 171*d* (3, 4) *dominula* upper and underside is shown.

The figures on 168*b* are so poor as to be well-nigh useless, but 171*d* is a fair representation of the form found at a low altitude in Tasmania.

Dr. Waterhouse, *in litt.*, notes that the only specimens known to him came from Billop, Bagdad, and (very doubtfully) Hobart. I am able to add Cranbrook as a further locality, S. Angel took four females on March 4th, 1945, in an area only a few feet above sea level; by far the lowest altitude of any record to date.

These specimens are notable for their expanse, wing length 15-17 mm.; and the yellowish-brown colour of the forewing above; both in size and colour this form differs greatly from the mountain form *pria*.

Anisynta dominula pria Waterhouse, 1932

An additional locality for this race is the Narcissus River valley near Lake St. Clair; from January 12th-19th, 1945, five males and one female were taken.

My experience in this district would show that *pria* is far from common. The specimens are noteworthy when compared with the lowland form from Cranbrook, the wing length of the males ranging from 12-13·5 mm., and the sub-apical and cell spots on forewing above, when present, are mere pin points.

Since the female is apparently undescribed, a description is appended.

Female upperside: forewing, grey-brown; cell spot, three sub-apicals and discal spots in areas 1*a*, 2 and 3, yellowish-white; the cell spot ·5 mm. diameter, other markings pin point in size; cilia white, at veins grey-brown. Hindwing grey-brown;

without markings, cilia white, at veins grey-brown, a yellowish pile over basal area. Underside; apex of forewing and the hindwing yellowish-brown; markings of forewing as above, cell spot and sub-apical spots silvery, spots in areas 1*a*, 2, 3, and a group of three in 4, 5 and 6 at termen, yellowish-white. Hindwing, a discal band of spots from 1*a* to 7 faintly divided at the veins; cell spot, and spot near base in 1*a*, silvery. Wing length, 13 mm.

Neallotype female labelled ' Cradle Mt. 21-I-17 (G. H. Hardy) ' in the Tasmanian Museum; paratype female ' Narcissus River, Tas. 2400 ft. 19-I-45. (L. E. Couchman) ' in coll. Couchman.

Many more specimens are required, from more localities, before it is possible to be sure of the limits of the superficially widely differing forms of *dominula* in Tasmania.

Summary

Additional localities are recorded, and new information added, for four species of Tasmanian butterflies; a new race of *Hesperilla chaostola* Meyr. and the female of *Anisynta dominula pria* Waterhouse is described, and *Geitoneura* Butler is revived as a generic title in place of *Xenica* as formerly used.

My thanks are due to many helpers, notably Capt. D. C. Pearse, W. A. Rainbow, Francis Hemming, C.M.G., and in particular, over a period of many years, to Dr. G. A. Waterhouse.

References

Butler, 1867.—*Ann. & Mag. nat. Hist. Lond.*, (3) 19: 164-165.
Hardy, 1917.—*Pap. & Proc. Roy. Soc. Tasmania*, 1916: 146-147.
———, 1918.—*Ibid.*, 1917: 67.
Turner, 1926.—*Ibid.*, 1925: 81-82; 118-123.
———, 1939.—*Ibid.*, 1938: 57-58; 105-106.
Waterhouse, 1932.—*Proc. Linn. Soc. N.S.W.* 57 (3/4): 225.
———, 1932.—*What Butterfly is That?* Sydney.
Waterhouse and Lyell, 1914.—*Butterflies of Australia.* Sydney.

Pap. & Proc. Roy. Soc. Tasmania, 1945 (1st October, 1946)

A Summary of the Tasmanian Phreatoicids: A Contribution to the Biological Survey of Tasmania

By

G. E. Nicholls

(Read 13th November, 1945)

In a recently published account of the *Phreatoicoidea*, there was proposed a division of that sub-order into two families, the *Amphisopidae* and the *Phreatoicidae*. The former, which is marked by a more primitive condition of the mouth-parts (particularly the mandibles and the maxillulae) is represented to-day by about seventeen living species; in addition one extinct species is known. These Amphisopid forms are divisible into five sub-families and are widely distributed, occurring in South Africa and Australia, but—while on the Australian mainland they are recorded from the South-West, from the Northern Territory, from South Central Australia, from Gippsland, the Grampians and the Otways in Victoria—very few (only three) are known from Tasmania, and two of these are somewhat doubtfully assigned to this family.

Of the second family, the *Phreatoicidae*, which make up a much larger assemblage (about forty species and sub-species) more than half are Tasmanian. They are divided into three groups which are conveniently named as sub-families. Of these the first (Phreatoicinae) consists wholly of blind forms restricted to southern New Zealand and South Eastern Australia (the Dividing and Plenty Ranges in Victoria, and Barrington Tops in New South Wales) ; about a dozen species are known and they seem to furnish a link between the *Amphisopidae* and the *Phreatoicidae*. Of these latter, the great majority are included in the sub-family *Paraphreatoicinae*, almost exclusively Tasmanian, occurring widely scattered over the island. The few mainland forms which survive to-day are known only from isolated mountain tops in the Victorian Alps.

A third and smallest of these sub-families is the *Mesacanthotelsoninae*, which, except for one (an Australian) species, appears to be confined to the Great Lake and Arthur Lake. Its interest lies in the retention by some of its species of peculiarly primitive characters which have been lost by practically all other living forms—*Mesacanthotelson* itself retaining a remarkably close resemblance to that enigmatic fossil *Acanthotelson* from the Carboniferous of North America, while *Onchotelson* is almost unique among living Malacostraca in preserving a well-defined first thoracic segment.

In the following list of Tasmanian species reference is, for the sake of brevity, made only to the paper on ' The Phreatoicoidea ' which has appeared in two parts (I and II) in the ' Papers and Proceedings of the Royal Society of Tasmania ' for

the years 1942 and 1943 (published in 1943 and 1944 respectively); in that may be found a complete synonomy and list of literature. Species represented in the material brought together by the Tasmanian Biological Survey are indicated here by the abbreviation 'Biol. Surv.', those from the writer's collection, by the initials G.E.N. Types of new species are lodged in the collection of the Tasmanian Museum, Hobart. Only of *Hypsimetopus intrusor* Sayce and of *Colubotelson tattersalli* Sheppard are there no representatives in that collection, the types of these two species being preserved respectively in the National Museum, Melbourne, and the British Museum, London.

Family 1. THE AMPHISOPIDAE

Sub-family 4. PHREATOICOPSINAE.

(1) Uramphisopus pearsoni Nicholls

1943, I, pp. 124-130.

The eyes, notwithstanding their size and prominence are probably undergoing reduction, there being but comparatively few facets; the species is outstanding on account of the large inner process of its uropod which gives to that appendage a tri-radiate appearance. It is restricted to the Great Lake, in the floor of which it probably leads a burrowing life; it has been obtained only from the stomach of trout: the female is unknown, the male may reach a length of 22 mm. and, in spirit-preserved material is of a dull brown colour. (Biol. Surv.)

Sub-family 5. HYPSIMETOPINAE

(2) Hypsimetopus intrusor Sayce

1943, I, pp. 131-2.

This is a blind, subterranean form, taken once only from burrows in the earthen dam of a mine 'near Zeehan, West Tasmania', 1901. Only the male is known. In life it is probably translucent, in spirit becoming an opaque creamy white.

(3) Phreatoicoides longicollis Nicholls

1943, I, pp. 136-144.

Like the preceding, this is a blind subterranean form from Western Tasmania. In life, it is translucent, colourless except for small and variable patches of pale yellow: the intestine showing through as a dark thread. Alcohol-preserved material is dull white and opaque. It has been taken somewhat freely under logs on the old 'corduroy' trail from Queenstown to Zeehan, in muddy hollows on the slopes of Mt. Heemskirk and, in boggy country, about thirteen miles from Gormanston, on the Lyell Highway. The first of these is now (January, 1944) ruined, as a collecting ground, by the draining which has accompanied the making of new roads from Queenstown to Zeehan and Strahan. (G.E.N.)

Family 2. PHREATOICIDAE

Sub-family 7. MESACANTHOTELSONINAE

All of the members of this sub-family have large, prominent, many-facetted eyes, in this respect resembling the condition of most of the Amphisopidae.

Mesacanthotelson Nicholls

1944, II, p. 61.

Members of this genus are readily distinguished by two conspicuous features—(i) the body is raised into a series of transverse ridges set with spines or strong setae, and (ii) the telson is produced backwardly into a stout sub-cylindrical process; the uropods are relatively long. Four species are known which, with one exception, are restricted to the Great Lake.

(4) Mesacanthotelson setosus Nicholls

1944, II, pp. 62-67.

There are a pair of tubercles on the head between the eyes; the transverse ridges on the segments for the most part bear stiff setae rather than spines; the telsonic process is slightly upturned and somewhat flattened, and is shorter than that of *tasmaniae*. Males reach a length of about 19 mm., females are known only in an immature condition. The colour, in spirit, is a more or less uniform dull grey; it was first taken by Miss Spargo, dredging along the old shoreline at the north end of the Great Lake, but has since been found sparingly in the stomach of trout. (Biol. Surv.; G.E.N.)

Some material, apparently referable to this species, has been taken quite recently and, being preserved in formalin, has retained, what may be assumed to be, more nearly the coloration in life. As a whole the specimens appear to be of a dull brown tint, but examined with the aid of a lens that effect is found to be due to a combination of two distinct colours. Upon each segment there is developed a narrow transverse stripe of a brown so dark as to be nearly black, followed by a more variable transverse band of dull yellow—posteriorly this yellow band increases in width as the segments increase in length. There is here, without doubt, a coloration which would render inconspicuous an animal living, as this does, amongst the slender vertical stems of the water-reed so widespread over the floor of the Great Lake. It may account for the fact that this species is one which has been taken relatively rarely from the stomach of trout.

From Arthur Lake there are a few specimens which came under my notice too late for inclusion in Part II of the Phreatoicoidea. They form part of the Tasmanian Biological Survey collection and were secured by J. V. Tanner (14.3.39). A superficial examination suggests that they should be assigned to this species and it would be extremely interesting to know whether there has been, in recent years, any transference of material from the Great Lake.

(5) Mesacanthotelson tasmaniae (G. M. Thomson)

1944, II, pp. 67-77.

A large, rather slender, spinous form with telsonic process long, projecting directly backwardly and set with spines along its length and, also, terminally; colour in life greyish to dark-brown, generally relieved on antennae and legs by brilliant bars of orange or reddish-brown, length about 24 mm.; found beneath stones or on the floor of the Great Lake and taken not infrequently from the stomach of trout (Biol. Surv.; G.E.N.).

(6) Mesacanthotelson decipiens Nicholls

1944, II, pp. 77-82.

Rather like *tasmaniae*, but a much smaller form with the transverse ridges much less developed and bearing setae; the telsonic process is shorter and distinctly

upturned and armed terminally with two pairs of stout spines, and with numerous setae. Its colour in spirit is grey to greyish-brown; in life it probably lacked the reddish bands on the appendages: it is known only from a few specimens taken from the stomach of trout. (Biol. Surv.)

(7) Mesacanthotelson fallax Nicholls

1944, II, pp. 82-86.

A small, rather rare, species in which the transverse ridges, though reduced, are armed with spines, although these, as compared with *tasmaniae*, are relatively few. It differs from the other species of *Mesacanthotelson* in that the terminal process is distinctly flattened and tapers into a sub-triangular process armed with two spines laterally and two terminally. Like the preceding, it is known only from material obtained from the stomach of trout. (Biol. Surv.)

Onchotelson Nicholls

1944, II, pp. 86-87.

This genus differs from the preceding in that the telsonic process is notably flattened and so sharply turned up as to give to the end of the body a hook-like form. The transverse dorsal ridges on the body are well developed and bear numerous fine setae: on the sides the body is strongly sculptured; the uropods are short.

(8) Onchotelson brevicaudatus (G. M. Smith)

1944, II, pp. 87-96.

Body strongly ridged, these ridges bearing setae dorsally. The animal occurs plentifully on the floor of the Great Lake (1), is straw-yellow in colour and reaches a maximum length of about 15 mm. (Biol. Surv.; G.E.N.)

(9) Onchotelson spatulatus Nicholls

1944, II, pp. 96-99.

Differs from *brevicaudatus* (and indeed from all known Phreatoicids) in bearing conspicuous, paired lateral spatulate outgrowths, arising from the coxae at the junction of the thoracic limbs with the body: colour, in alcohol, a greyish-yellow. Only once taken (in April, 1939) by Dr. Pearson from under stones on the shore at a point which is now some score of yards out in the lake due to the continued elevation of the water-level of the lake. (Biol. Surv.)

Sub-family 8. PARAPHREATOICINAE

Paraphreatoicus Nicholls

1944, II, p. 104.

(10) Paraphreatoicus relictus Nicholls

1944, II, pp. 105-108.

Has been taken abundantly under stones in Stringy-Bark Creek near the railway station at Woodbury. The animal differs from all other members of this sub-family in that the endopodite as well as the exopodite of the first pleodod retains

(1) Some specimens undoubtedly referable to this species, accompanied by a few *chiltoni*, were found in the stomach of a 'box fish' caught in the Derwent Estuary, that is, in salt water. Since this species is known only from the Great Lake, it is probable that these were specimens washed down by way of the Shannon and picked up (probably dead) by the ground-feeding fish.

a heavy fringe of setae. The largest male specimens are about 12 mm. in length; of the female only immature examples have been seen. The colour in life is dark-brownish grey, matching the mud of the creek bed. Specimens have also been taken in the tiny creek running down through St. Peter's Pass, but these seem to differ in the condition of the first pleopod and may have eventually to take rank as a new sub-species. (Biol. Surv.; G.E.N.)

Colubotelson Nicholls

1944, II, p. 108

Members of this genus are found widely distributed over much of Tasmania, the species being rather difficult to distinguish. In all of them the telsonic process is reduced to a short stump which is sharply upturned and bears four terminal spines (except, perhaps, *tattersalli*); on the first pleopod the endopodite has no setal fringe.

(11) Colubotelson thomsoni Nicholls

1944, II, pp. 111-113

About 12 mm. long, this species is found abundantly on the summit of Mt. Wellington and may be found also in the overflow from the Ridgeway Reservoir. Its colour (in spirit) is light-brown with darker brown marblings over much of the surface. (Biol. Surv., G.E.N.)

(12) Colubotelson evansi Nicholls

1944, II, pp. 114-115

A small species (about 10 mm.) of dull yellow-brown colour, taken in 1929, at Waratah in West Tasmania in ditches near the hotel. (G.E.N.)

(13) Colubotelson campestris Nicholls

1944, II, pp. 116-118

Another small species (about 10·5 mm. in length) known only from a waterhole and a creek at Huntingfield, near the Derwent Estuary. Brownish, with darker marblings. (G.E.N.)

(14) Colubotelson huonensis Nicholls

1944, II, pp. 118-121

A light-brown Phreatoicid about 14 mm. long, taken in ditches at little above sea-level at Kermandie near Port Huon. (G.E.N.)

(15) Colubotelson huonsis sub-species flynni Nicholls

1944, II, p. 121

This is known only from juveniles taken in January, 1928, by Professor Flynn from a roadside puddle at Eaglehawk Neck. It differs from other species in the unusual degree of development of the toothed spine at the end of the peduncle of the uropods.

(16) Colubotelson gesmithi Nicholls

1944, II, pp. 122-124

A pale greyish-brown species taken in January, 1928, from under water plants in small creeks crossing the trail up Mt. Field, the largest male not reaching 11 mm., one female measured 9 mm. The eyes are small, almost obsolete, obviously far gone in degeneration. (G.E.N.)

(17) COLUBOTELSON CHILTONI Sheppard

1944, II, pp. 124-126

Originally regarded by G. Smith as a sub-species of *australis*, it is abundant in the Great Lake. Dark-brown with marblings and markings of lighter colour, about 14 mm. long. It occurs also in the Shannon Lagoon. The profile of the tailpiece shows an angular projection immediately beneath the telsonic projection. (Biol. Surv.; G.E.N.)

Specimens taken recently near Bronte (Marlborough) in a small moorland creek seem to be indistinguishable from *chiltoni*. Others, also taken recently from a 'billa-bong' alongside the Lake St. Clair-road, are very near akin and with still others (sent by Mr. A. Bingham of Gormanston and taken from the stomach of trout caught in Lake St. Clair), are probably to be referred to a sub-species only of *chiltoni*.

(18) COLUBOTELSON CHILTONI sub-species MINOR Nicholls

1944, II, pp. 126-127

A smaller form, differing little from *chiltoni*, which it resembles in colour. Taken by Miss Hutchinson in February, 1928, from Pine Lake. (G.E.N.)

(19) COLUBOTELSON CHILTONI sub-species SAYCEI Nicholls

1944, II, pp. 127-130

In spirit, pale yellow with dendroid marking of chocolate-brown. Taken by Professor Spencer in Lake Petrarch about 1900. The types are preserved in the National Museum, Melbourne.

(20) COLUBOTELSON FONTINALIS Nicholls

1944, II, pp. 131-132

Resembling *chiltoni* in size, slightly paler in colour. Occurs freely in surface waters around Lemana Junction and Deloraine. This species is tending to become blind, many specimens showing an advanced stage of degeneration of the eyes. (G.E.N.)

(21) COLUBOTELSON TATTERSALLI Sheppard

1944, II, pp. 133-135

Recorded by Miss Sheppard from 'under stones along the shore of the Great Lake at Todd's Corner'. It is small (10 mm. in length) and, as described, differs from all other recorded species of this genus in having but two spines on the end of the telsonic projection. The colour (spirit material) is described as dark-brown. The telsonic pleura curve away smoothly from the telsonic process to the uropod, in this resembling *C. intermedius*.

(22) COLUBOTELSON TATTERSALLI sub-species DUBIUS Nicholls

1944, II, pp. 135-139

The specimens recorded under this name were taken recently (Dec., 1943) from beneath stones in the bed of Todd's Creek at the point where it discharges into the Great Lake. With the damming of the Great Lake a large area, once swampy ground, has been submerged and the old shoreline is now some distance out in the lake. Along the present shoreline no stones were found, nor were any Phreatoicids taken by dredging in shallow water in this area, but in the creek itself specimens were fairly abundant. Agreeing in colour with Miss Sheppard's description of *tattersalli*, but differing in that the apex of the telsonic process was armed, as is usual in this genus, with four spines. The antennary flagellum did not show the features recorded by Miss Sheppard for *tattersalli*. The largest specimen—a male—was nearly 14 mm. in length. (G.E.N.)

(23) COLUBOTELSON INTERMEDIUS Nicholls

1944, II, pp. 139-142

Probably the commonest of the Great Lake forms; large specimens may reach a length of 14 mm. In life the colour is brownish or greyish-brown, the pigment upon the bases of the peraeopods distributed only in fine veinings, whereas in *chiltoni* it is in solid splashes; after prolonged preservation in spirit, the colour fades to a pale yellowish-brown. This species agrees with *tattersalli*, and differs from *chiltoni* in its telsonic profile, which is smoothly convex beneath the telsonic projection. (Biol. Surv.; G.E.N.)

(24) COLUBOTELSON SETIFERUS Nicholls

1944, II, pp. 142-144

A very slender, almost vermiform, animal, the male about 11 mm. long. In spirit, specimens had a pale creamy tint. Collected once only from a damaged part of the pipeline leading from the local reservoir to Scottsdale. (G.E.N.)

From Mt. Arthur, which lies on the far side of the watershed from that which supplies the reservoir at Scottsdale, a small number of Phreatoicids has been sent me by Miss L. van Gooch of the Queen Victoria Museum, Launceston. These have not yet been carefully studied, but the preliminary examination suggests they are probably distinct from *setiferus*. The body is rather more robust and quite distinctly pigmented.

Yet another species, as yet unnamed, must be referred to the genus *Colubotelson*. This has recently been collected from a weed-grown ditch near the top of the Golden Valley, some twenty odd miles south from Deloraine. The country here is recently-cleared beech forest land, some tree ferns still standing. The half dozen examples are all immature, but agree with *setiferus* in that the body has very little pigment. (G.E.N.)

METAPHREATOICUS Nicholls

1944, II, p. 144

This genus differs from *Colubotelson* in the possession of six terminal spines upon the apex of the telsonic projection. The Australian representative is *M. australis* from Kosciusko. Two Tasmanian species are known.

(25) METAPHREATOICUS MAGISTRI Nicholls

1944, II, pp. 149-151

Large males reach 15 mm. in length; the species has been taken in a small swamp (and ditch draining therefrom) on the sandspit that joins the northern and southern parts of Bruni Island. In colour it is practically indistinguishable from *australis*. (G.E.N.)

(26) METAPHREATOICUS AFFINIS Nicholls

1944, II, pp. 151-154

Known only from a very few specimens taken by Miss Spargo on Wombat Moor. The largest measured 13 mm., and the colour in spirit is a light-brown. It is unusually difficult to classify this species, for it shows relationships with several other Tasmanian forms and is perhaps intermediate between *Metaphreatoicus* and *Colubotelson*. (G.E.N.)

Ecology of the Fresh Water Fauna of Lake St. Clair, particularly the Copepoda, with special reference to Diurnal and Seasonal Variations in Conditions

By

A. W. G. Powell
Geelong College

(Read 13th November, 1945)

1. Introduction

The main object of the survey was to gain a foundation knowledge of the ecology of Lake St. Clair, especially of the Copepoda, and, to a lesser degree, the Cladocera, done primarily from the purely scientific point of view, and secondarily from the economic aspect.

Therefore the main physical and chemical conditions prevailing, the plants and animals of the lake bed, the plankton and the fish, all received some degree of attention.

Since the food of the fish consists very largely of plankton crustacea, the survey was concentrated on these creatures.

In the present report, an account is given of the species of Crustacea occurring in the plankton, their relative abundance throughout the year, and the factors having some influence on, or connection with, the variations observed.

2. Revision of Previous Work

No ecological study of the plankton in Tasmanian lakes had previously been attempted. The only systematic work on the fresh-water Crustacea of Tasmania was done by Geoffrey Smith in 1907.

Ecological work of this nature has been carried out in Europe and America for some years, and valuable guidance as to methods, equipment, etc., was gained from various reports. Without wishing to apologize for this particular effort, one could not help feeling envious when reading of the equipment and assistants available to the majority of the authors listed. Various volunteer assistants rendered valuable service, to which due recognition is given, but this could not take the place of a full-time team of specialists which the study demanded.

3. Equipment

Field headquarters were at Cynthia Bay in the south-western corner of the lake. This is the terminus of the road to the lake. Use was made of the police trooper's hut for accommodation, preserving catches, etc. The main investigations

were carried out in (1) Tasmanian Museum, (2) Technical College, (3) University of Tasmania, all in Hobart, from the material collected. A large rowing boat fitted for use with an outboard motor (which was not used in this work) was used. As far as possible the apparatus used was adapted to fit this boat.

FIG. 1.—Sketch Map of Lake St. Clair Area.

NOTE.—The Cuvier River joins Hugel Creek before entering the lake.

The following equipment is required for meteorological and physical investigations—

Temperature.—Temperature readings of air and water were taken whenever possible. One thermometer was inadvertently broken at the lake, and the next, procured from the Weather Bureau at Hobart, was so inaccurate, having a broken scale, that it had to be discarded. More accurate instruments were in use during the last few months. A reversing water-bottle used for water sampling, also recorded temperatures at selected depths.

Rainfall.—This was recorded at the Hydro-Electric Commission's works at Derwent Basin, about one mile by air from Cynthia Bay, during the latter part of the investigations.

Water Level.—This was controlled by the Hydro-Electric Commission at Derwent Basin, where a dam and pumping station were being erected near the mouth of the lake at the Derwent River source.

Tow-nets of fine-mesh silk (obtained from Thomas Robinson & Son, Sydney) were used for plankton work. For obtaining plankton at a depth, a depth-net closing device was obtained. This was on the lines of that indicated in 'Discovery Reports' (1929, p. 192). The net was lowered by means of a winding drum, the cable of which operated a 200-metre wheel. This apparatus was not available until late in the survey. Pumping to obtain plankton from various depths was resorted to, using an 'Ajax' hand-pump, which brought up 0·1041 gallons per stroke. This proved very exhausting work, which was not very satisfactory in its results. These were not commensurate with the amount of labour involved, even when the pump itself functioned satisfactorily.

In addition to the above, several large-mesh dredge nets were used for collecting the bottom fauna near the lake shore. A fish trap was used at frequent intervals, but no fish were caught. However, in October, 1938, the trap was responsible for the capture, in the mouth of the Cuvier River, of a fresh-water lobster, which was identified by Miss Ellen Clark, of the National Museum, Melbourne, as *Astacopsis tricornis* Clark. As this is the largest specimen so far found, Miss Clark has redescribed the species from it in the 1938 Papers and Proceedings of the Royal Society of Tasmania. The species is known only in the Lake St. Clair region.

4. Description of Lake St. Clair Area

Lake St. Clair is 2400 ft. above sea level and covers an area of about fifteen square miles. It is rather narrow, having a length of about twelve miles and an average width of less than one mile, except at the southern end, where it broadens out into Cynthia Bay on the south-western side and Derwent Basin on the south-eastern side, the width there being about four miles.

Except at the southern end, the lake is entirely surrounded by mountain ranges, which dip steeply into it on the eastern and western shores. Numerous small streams flow into the lake. The two larger ones are the Narcissus River in the north, flowing through button-grass plains from the Du Cane and Gould Mountains, and the Cuvier River, which flows from the west into Cynthia Bay, also through button-grass plains. There are several small sandy beaches around the lake, chiefly at the southern end. Here the lake bed shelves gently, the sand giving place to sandy mud in which Chara grows freely. Between the southern beaches the shore is rocky with many large dolerite boulders, 10 ft. or more in diameter projecting from the water. The lake is very deep in its narrow part, being over 720 ft., just beyond Myrtle Point (see map, fig. 1). However, in the station where observations were made (north-east from Cynthia Bay Beach) the depth varies fairly gradually from zero to something over 100 ft., shoaling occasionally. The bottom is composed chiefly of fine, soft mud.

Lake St. Clair lies on the fringe of a small area of sedimentary rocks of Mesozoic Age, but is almost surrounded by diabase mountains formed by the lava flows at the end of that age, and is possibly of glacial origin, although this is disputed. The southern and eastern shores are of dolerite, while the northern and western shores consist of permo-carboniferous sandstones and mudstones. At the southern end, according to R. M. Johnston (1888), is a terminal glacial moraine of varied composition, giving rise to beaches. The Cuvier River circulation in Cynthia Bay causes sand suspension at times.

Weather.—Rainfall of watershed, between 60 inches and 80 inches; frost frequency, 12 months.

5. Methods and Technique

The collection of plankton by both horizontal and vertical hauls was carried out, but the regular work was done with horizontal hauls only, since these enabled more readily comparable results to be obtained.

Whereas the vertical hauls resulted in very small catches owing to the comparatively small distance through which the net could be moved, the horizontal hauls produced, as a general rule, catches which could easily be removed and examined both quantitatively and qualitatively.

The following plankton nets were used.—

Net No. 1.—This is a very fine-mesh net used only in the early stages of the work, before two nets of the same mesh were available, and at

intervals later when quantitative results were not required. Diameter of ring, 30·9 cms; meshes per cm., 34.

Net No. 2.—This is a fine-mesh net. Only one was available when the work was commenced, but as soon as the second became available the two nets were used for simultaneous surface and depth horizontal hauls. Diameter of ring, 30·5 cms; meshes per cm., 26.

Each of these nets was 110 cms. long, with calico hems 17 cms. long at top (around a brass ring) and 20 cms. long at the bottom. Instead of the usual collecting bottle at the end, the open end with a diameter of 8·3 cms. was doubled over and securely closed by means of a rubber band.

Methods of Making Horizontal Hauls

(1) Surface Hauls.—The net, attached to a metal thimble by lines from three rings on the large brass ring of the net, was hauled behind the rowing boat by means of a strong ¼-inch rope. In order to prevent the net breaking surface, a small weight was hung from the thimble. As soon as the boat had been rowed a suitable distance from the shore, the net was washed out, fastened at the end with a rubber band, and thrown over the stern. It was then tugged two or three times to remove air from inside, and the rope was allowed to become taut. In this condition it was then towed at a steady rate for 15 minutes. Constant rowing over the same course resulted in the same distance being covered on each occasion, as shown by shore bearings. Rough waters and winds affected this distance to some extent, but the necessary allowance was always estimated and rowing continued or halted as required.

(2) Depth Hauls.—Depth hauls were carried out in an exactly similar fashion, a heavier weight being required, and a measured length of rope used to secure the required depth, a constant angle being maintained under calm conditions. A difference in the speed of the boat made a greater difference here, owing to the heavier weight tending to pull the net down when the boat was slowed up. However, this occurred on infrequent occasions. When steady winds were blowing, the rope was adjusted in length before rowing commenced, thus preventing any error in depth.

(3) Horizontal Hauls at Greater Depth.—A few of these were carried out near Myrtle Point, in the deeper part of the lake, using the winding gear, metre-wheel, depth-closing device and plankton-net, specially adapted for use with the closing device.

Methods of Making Vertical Hauls

For this purpose the depth-winding-gear, designed primarily for the reversing water-bottle, was used. A weighted net was attached to the end of the cable and slowly lowered, closed end first, to the required depth, as measured by a metre-wheel. From this point it was raised at a uniform speed to the surface. The following extract is taken from the author's log for March, 1938: 'The winding-gear is very heavy and cumbersome and owing to its height above the boat can be used safely only in calm weather'.

Use of 'Ajax' Pump

As already mentioned, this was a hand-pump of 0·1041 gallons per stroke, with about 30 ft. of hose attached to the inlet. Water from various depths was obtained by lowering the nozzle to the required depth after priming. The outlet nozzle was then held over a net of known mesh (one of those used for horizontal hauls) and the water strained through it over the side of the boat. By this means the plankton from a known volume of water was collected. The pump did not always function satisfactorily, however, whilst the method was far too laborious, and the apparatus too unwieldy for regular diurnal observations.

Southern and Gardiner (1926) using a semi-rotary type pump expressed a similar opinion. They state: 'The method is too slow and cumbersome for normal use in the study of the seasonal distribution of the plankton crustacea over a large area'.

Bottling and Preservation of the Catch

After each haul the nets were washed down, first from the outside, thus transferring the total catch to the closed end which was then undone over a quart-size Kilner preserving jar, into which the catch was washed. This resulted in a comparatively large quantity of water, so the next step was to reduce the water content by filtering through silk of slightly finer mesh than the collecting net. This filter net was mounted on a jam tin with holes pierced in its sides, the net being given a concave upper surface, and held in position by a rubber band. The waste water was allowed to run off, and a mass of plankton collected in the net. The plankton was washed into small bottles of about 100 cc. capacity by means of the ordinary wash bottle as used in any chemical laboratory. By this means the quantity of water added was kept to a minimum. Labels written with Indian ink were placed in each bottle and the contents were preserved with a 70 per cent solution of methylated spirits. Felt-lined boxes, holding 16 bottles, each in a separate compartment, were used to transport the catches from the lake to the Tasmanian Museum for quantitative work.

Methods of Measuring the Catch

Two methods were used:—

(1) Measurement of settled volume.
(2) Individual count of representative sample.

A sample graph comparing the total catch as indicated by the two methods is given, fig. 2, (*a*), (*b*).

Method (1).—This was soon abandoned as inadequate. The catches, each in the same volume of water, were allowed to settle for some considerable time, and the height of plankton measured, the bottles being of uniform diameter. Whilst giving some idea of the total plankton collected, this method was of no value for different groups.

Method (2).—This was developed after some experimenting. When the technique was mastered all catches, including the earlies ones, were counted by the following means:—

The catch was washed out of its bottle into a 100 cc. jar using 70 per cent methylated spirits in the standard type of wash bottle. Spirits was added to bring the level to the 100 cc. mark.

The liquid was thoroughly agitated with a shaped glass rod.

With the plankton thoroughly mixed, 10 ccs. were withdrawn by means of a wide-mouthed pipette at about 40 ccs. level, and placed in a circular glass dish of diameter 78·0 mms. This provided a thin layer of liquid with the plankton more or less evenly distributed. The dish was placed on the top of a specially ruled glass slide on the platform of a binocular dissecting microscope. The individuals of the plankton were then counted, and the numbers of different types recorded. The glass slide consisted of a lantern slide, with its gelatinous layer carefully ruled off into squares each of side 2·6 mms. and then finished off as a lantern slide. Counts were made over a number of squares, the results being averaged. The method was modified for smaller catches. An exact correspondence between these two methods cannot be expected, since larger numbers may be largely comprised of smaller individuals, thus giving a lower reading for settled volume. In view of this, fig. 2 shows

that the two methods give a very satisfactory comparison in results. Where the plankton is of a uniform nature, as in this instance, the big value of estimation of quantity by settled volume is that it gives the total amount available for food.

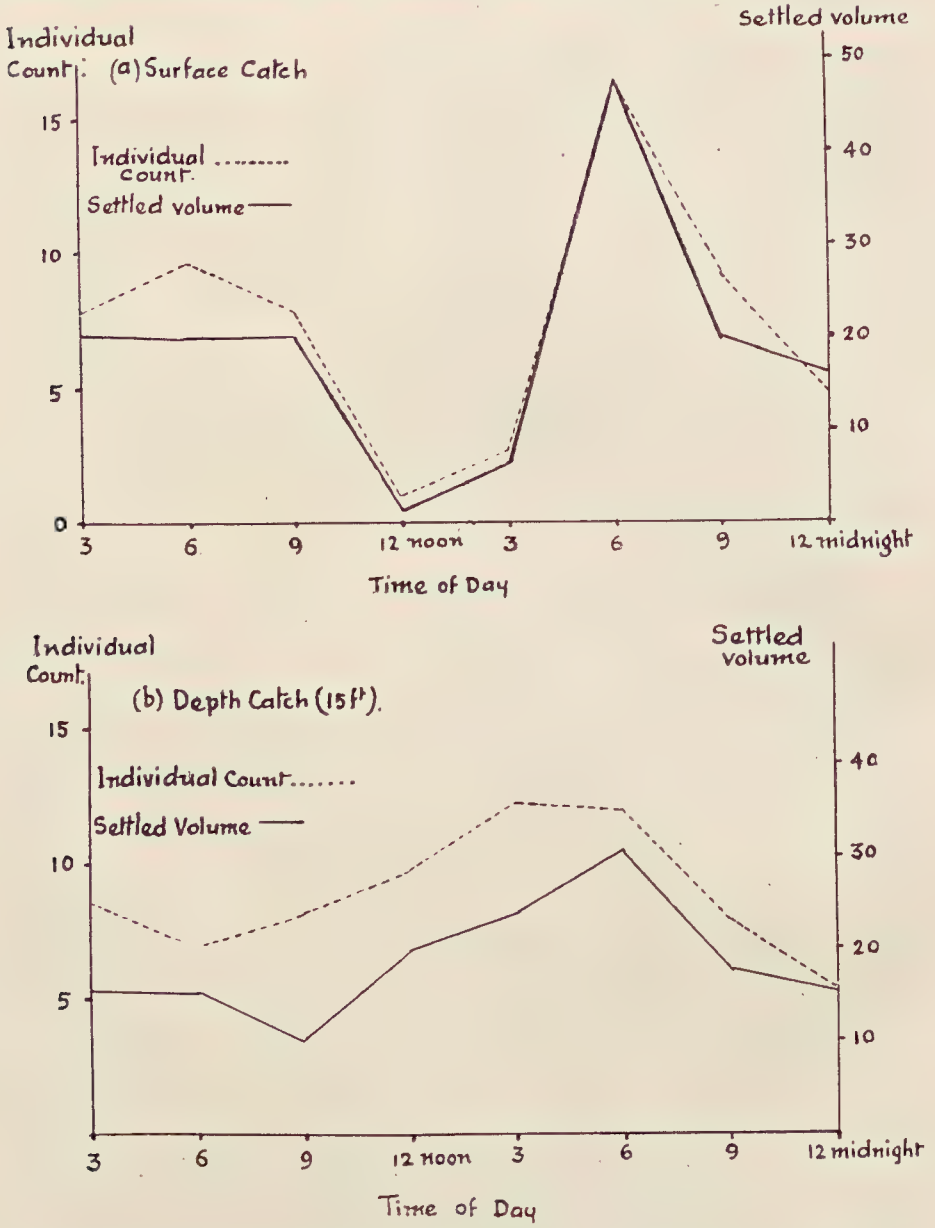


FIG. 2.—Graphs comparing total plankton catch as indicated by two methods of measuring.
(i) Measurement of settled volume (R.H. axis).
(ii) Individual count of representative sample (L.H. axis).
All samples were collected on 27th Aug., 1937.
The maximum catch, 6 p.m. surface, has been taken as the standard of comparison in selecting the scale units for the two methods.

Accuracy of Above Methods

(*a*) Medium Nets were Used.—A fine net would have lost more plankton. Small and immature species were certainly lost, but the more mature species of both Copepoda and Cladocera were retained.

(*b*) Age of Nets.—Southern and Gardiner (1926) found that older nets catch more than new ones, but the excess is within the range of normal error in sampling and counting (5-15 per cent), so that use does not materially affect the catching power of a medium silk net.

(*c*) Irregular Vertical Distribution of Plankton.—On occasions the catch was singularly small at either surface or depth. Thus a catch at one or the other was not representative of the actual concentration of plankton in the lake, but did suggest certain migrational tendencies according to conditions.

(*d*) Variations in Length of Haul.—Differences caused by disturbed weather conditions and the methods of counteracting them have already been discussed.

(*e*) Sampling at a Single Station.—Ricker (1938), having taken samples over a thirteen-year period, found that collections taken at a single station will indicate the average abundance of plankton almost as well as over the whole region.

(*f*) Errors in Counting the Catch.—The method of averages having been employed to estimate the relative numbers of the thousands caught, the error introduced here is probably small, but cannot be accurately determined.

6. Physical and Chemical Observations

A. As there was no fully-equipped weather station at Lake St. Clair, it was not possible to obtain complete observations, but from January, 1937, records of temperature, wind, cloud, and general remarks were obtained from Tarraleah, which is situated some fifteen miles away as the crow flies, and may be considered to have roughly comparable weather conditions. These figures were supplemented by personal observations at the lake itself during each trip to collect material.

B. Temperatures

(1) *General*

Thermometers proved to be somewhat uncertain instruments. The first, used for air and water temperatures, was soon broken. The second, borrowed from the Weather Bureau, was unreliable, having a broken scale; the third, a pair on the reversing water bottle borrowed from Ceylon, were very erratic, and for the most part did not synchronise.

The fourth, a pair on a second reversing water bottle (procured by the University of Tasmania for this work) proved quite satisfactory, and these were in use in the latter part of the research.

Concurrently with this, a new ordinary thermometer was used to obtain surface and air temperatures.

(2) *Air Temperatures*

The Tarraleah records, supplied by the Commonwealth Meteorological Bureau at Hobart, were by no means complete, a few days being omitted in nearly every

month, but they give some idea of the temperature variations from 1937 to 1939. From the figures supplied, the following table of mean monthly temperatures in Fahrenheit degrees was derived:—

TABLE 1.

Tarraleah Temperatures in °F.

* Reading across 1 = Mean monthly maximum.
2 = Mean monthly minimum.
3 = Mean monthly temperature.

*	Jan.	Feb.	Mar.	April	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Ann. Mean
1937—													
1	61·5	66	63·5	54	50	43	47	50·5	52	57	65	63·5	56·1
2	46	49	46·5	38	37	29	34	35·5	38	42	44	45·5	40·4
3	53·8	57·5	55	46	43·5	36	40·5	43	45	49·5	54·5	54·5	48·3
1938—													
1	67	65·5	65	59·4	55·9	46·6	45·4	48·7	54·7	60·8	64·7	64	58·1
2	47	47·9	46·4	43·9	40·7	34·2	32·1	34·2	35·9	40·0	43·7	40·2	40·5
3	57	56·7	55·7	51·7	48·3	45·4	38·8	41·5	45·3	50·4	54·2	52·1	49·3
1939—													
1	71·3	75	64·8	61·1	55·1	49·7	45·6	46·6	51	58·8	57·5	11 months	58·8
2	41·6	47·4	42·4	43·2	40·2	34·7	32	35·4	36	37·9	44·1		39·5
3	56·5	61·2	53·6	52·2	47·7	42·2	38·8	41	43·5	48·4	50·8		49·2

(3) *Water Temperatures*

Table 2 gives the various surface-water temperatures obtained, together with the corresponding air temperatures (°C.).

TABLE 2

Water Temperatures (°C.)

Date	1938	1939											1940	
	18·10	25·2		26·2	12·4	13·4			20·5			21·5	16·8	30·11
Time	11 a.m.	10 a.m.	3 p.m.	11 a.m.	5 p.m.	8·45 a.m.	12 noon	5 p.m.	8 a.m.	11 a.m.	5 p.m.	9 a.m.	2·30 p.m.	3 p.m.
Air	—	14·6	14·3	10·7	16·3	12·9	11·4	11·6	9·4	10·0	9·5	8·9	11·1	23·3
Surf.	8·4	13·7	15·2	15·8	12·2	13·6	13·5	13·3	10·0	10·6	10·6	10·0	5·6	12·8

The range of water temperature here revealed is from 5·6 to 15·8°C. The lower limit was almost certainly reduced during the winter of 1937, when the work was commenced, for in May and June of that year an unusual succession of frosts was experienced throughout Tasmania, see Table 1, and, although the lake

itself did not freeze, there was more than once a slight encrustation of ice around the margin of Cynthia Bay. During towing on those nights any water inadvertently splashed into the boat changed to ice before it could be brushed from the clothes.

Table 3 gives a list of the sub-surface water temperatures as measured by thermometers on the reversing water-bottles used for water-sampling.

The water temperatures given in the table were obtained from between the end of the tow-course and 'Fergie's Beach' (see map).

TABLE 3

Water Temperatures

Date	18.3.38	20.4.38	31.8.38	26.2.39	13.4.39	20.5.39	30.11.40
Time			11·30 a.m.	11 a.m.	12 noon	5 p.m.	3 p.m.
Air Temp.	17·4°C	10·6°C	9·6°C	10·7°C	11·4°C	9·5°C	23·3°C
Surface				15·8	13·5	10·6	12·8
6 Metres				13·4	13·4	10·5	
7·5 Metres							9·32
10 Metres						10·4	
15 Metres			7·1	13·2	13·3		8·35
26 Metres			6·9				
30 Metres	10·9			9·3	10·9		
38 Metres		11·6	6·9				
60 Metres	10·9*	11·0					

* Water-bottle on bottom.

In each case there is a drop in temperature from the surface downwards.

During March, April, and August, 1938, i.e., autumn and winter, there was no indication of a thermocline, the temperature being about 11° C. at thirty to sixty metres in both March and April and 7°C. at fifteen to forty metres in August. The readings for February and April, 1939, however, suggest a definite summer thermocline at a depth of fifteen metres. Below this level the water temperature probably does not exceed ten to 11°C. throughout the year, providing a refuge for fish and other aquatic organisms preferring a uniformly cool habitat [cf. Leim (1935)].

C. Rainfall and Water Level

Only Tarraleah rainfall figures are available for 1937, but the St. Clair figures are given from then onwards. A comparison of corresponding rainfalls shows that the St. Clair figures are usually 5 to 10 per cent higher than those at Tarraleah. (See Table 4.)

The water-level at Lake St. Clair was under artificial control from the beginning of the investigations owing to the construction of a dam at Derwent Basin by the Hydro-Electric Commission, from whom the figures appended were obtained. (Table 4A.) The graphs, fig. 3, show the connection between rainfall and water-level. The graphs are of the same general shape, allowing for artificial changes caused by hydro-electric requirements.

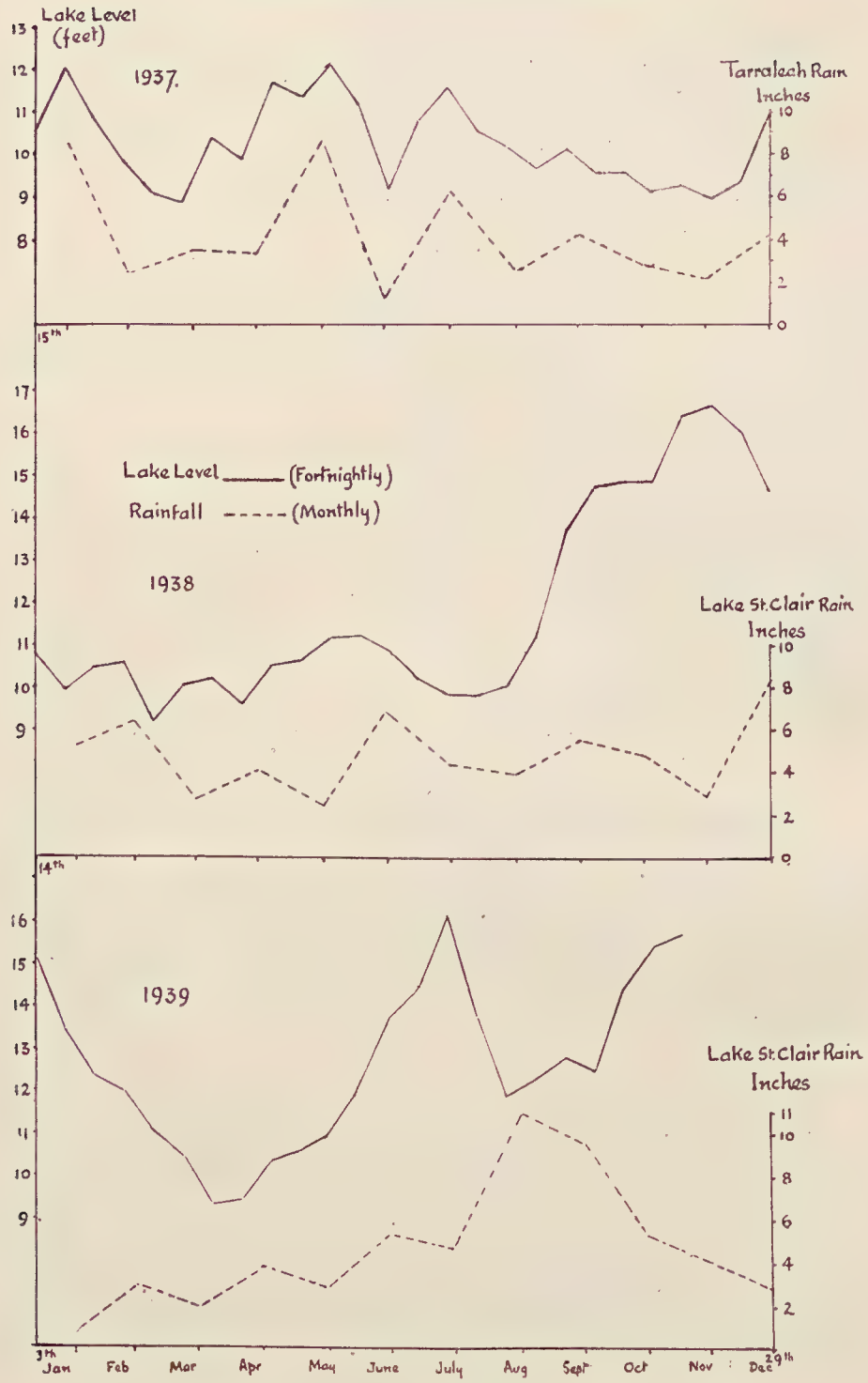
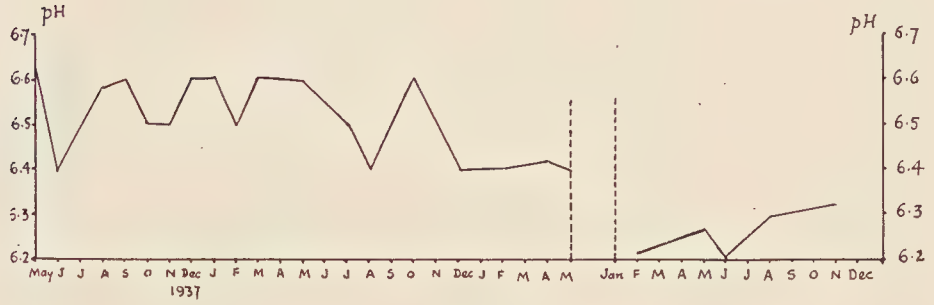


FIG. 3.—Graphs comparing lake level and rainfall (see Tables 4 and 4A).

These requirements are, of course, often unrelated to the natural changes, so that the life of the lake has in recent years been subjected to unusual conditions, not the least of which is the inundation of the shore-line to a much greater extent than was possible before the natural level was interfered with. The drowning of shore-side vegetation undoubtedly caused an increase in the acidity of the water—see pH curves (fig. 4). Heavy rainfall on occasions caused flooding of the Cuvier River, the current from which crosses south of the netting course.



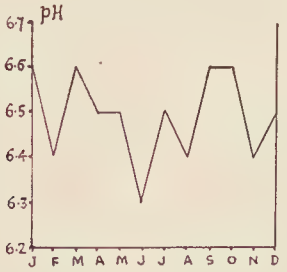


Fig. 4 pH Valves
Lake St. Clair, Surface.

Ueno (1939) in discussing Zitugetu-tan (Lake), the depth of which was raised in 1934 from five to eighteen metres for hydro-electric purposes, records a remarkable decrease in the number of plankton animals and the appearance of hitherto unrecorded forms. It appears that a sunken forest may completely change the lake-type. Changes in Lake St. Clair water and plankton may therefore occur, although the foreshore was not permanently inundated.

TABLE 4

Rainfall

Month	Tarraleah		Lake St. Clair			
	1937		1938		1939	
	Days	Points	Days	Points	Days	Points
January	24	858	14	517	7	63
February	10	244	8	638	8	277
March	8	354	13	263	8	185
April	18	339	16	403	15	366
May	25	873	15	237	16	280
June	13	109	23	679	26	523
July	25	631	12	433	17	462
August	21	250	17	389	31	1099
September	20	430	16	548	23	941
October	15	285	19	472	19	521
November	12	223	15	289	17	399
December	21	427	15	834	14	283

TABLE 4A

Levels of Lake St. Clair (Fortnightly)

1937	Level	1938	Level	1939	Level
1st January	no reading	14th January	2310·80	13th January	2315·20
15th January	2310·55	28th January	9·90	27th January	13·40
29th January	12·08	11th February	10·40	10th February	12·30
12th February	10·86	25th February	10·50	24th February	11·97
26th February	9·80	11th March	9·13	10th March	11·05
12th March	9·10	25th March	9·97	24th March	10·40
26th March	8·90	8th April	10·15	7th April	9·30
9th April	10·40	22nd April	9·55	21st April	9·40
23rd April	9·90	6th May	10·47	5th May	10·30
7th May	11·70	20th May	10·55	19th May	10·50
21st May	11·40	3rd June	11·13	2nd June	10·80
4th June	12·15	17th June	11·15	16th June	12·03
18th June	11·13	1st July	10·80	30th June	13·70
2nd July	9·20	15th July	10·15	14th July	14·40
16th July	10·80	29th July	9·80	28th July	16·13
30th July	11·63	12th August	9·80	11th August	13·70
13th August	10·55	26th August	10·00	25th August	11·90
27th August	10·20	9th September	11·15	8th September	12·30
10th September	9·70	23rd September	13·68	22nd September	12·80
24th September	10·15	7th October	14·70	6th October	12·47
8th October	9·60	21st October	14·80	20th October	14·40
22nd October	9·57	4th November	14·85	3rd November	15·40
5th November	9·15	18th November	16·40	17th November	15·70
19th November	9·30	2nd December	16·68		
3rd December	9·02	16th December	16·00		
17th December	9·40	30th December	14·63		
31st December	10·45				

D. WIND

As already mentioned, wind records from Tarraleah, and later Derwent Basin, were available, being supplemented by personal observations during visits. The following figures have been compiled by the use of the abovementioned records:—

TABLE 5

Tarraleah: Wind Direction: Daily Analysis

	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1937—													
N.	0	0	0	0	0	0	1	2	0	0	0	1	4
N.W.	0	1	1	0	0	0	2	1	3	1	4	7	20
W.	10	2	8	8	9	2	7	5	11	10	5	5	82
S.W.	5	1	0	0	0	1	3	2	3	2	3	6	26
S.	1	0	0	0	0	0	0	0	0	1	0	0	2
S.E.	0	2	1	0	0	0	0	0	0	1	0	3	7
E.	0	0	0	0	0	0	0	0	0	0	0	1	1
N.E.	2	0	0	0	0	0	0	0	0	0	0	0	2
Calm	13	22	21	21	22	27	17	21	12	15	16	8	115
1938—													
N.	0	1	4	3	1	0	0	0	2	0	0	1	12
N.W.	9	8	14	12	15	5	2	3	7	10	5	4	94
W.	3	7	6	7	9	8	9	11	6	5	13	9	93
S.W.	0	2	2	2	4	1	2	3	1	2	1	4	24
S.	0	0	1	1	0	0	0	1	0	0	0	0	3
S.E.	0	1	0	0	0	0	0	0	0	1	1	0	3
E.	0	0	0	0	0	0	0	0	0	0	0	0	0
N.E.	3	2	2	2	0	0	0	2	0	0	0	0	11
Calm	14	4	0	0	0	11	13	7	10	8	5	10	82
1939—													
N.	0	0	0	1	0	0	0	0	0	0	0	Total for 11 months.	1
N.W.	5	1	3	1	2	2	0	1	3	3	8		29
W.	10	6	7	6	5	0	1	0	3	0	7		45
S.W.	2	0	3	1	4	0	0	0	0	1	4		15
S.	0	0	0	0	0	0	0	0	0	0	0		0
S.E.	0	0	0	0	0	1	0	0	0	0	0		1
E.	1	1	0	0	0	0	0	0	0	0	0		2
N.E.	0	0	0	0	0	0	0	0	0	1	0		1
Calm	9	16	14	14	18	21	25	26	19	26	8		196

TABLE 6

Summary of Wind Directions (Tarraleah)

Directions	1937	1938	1939	Total
N.W. to S.W.	128	211	89	428
Others	16	29	5	50

The records supplied by the Weather Bureau were incomplete, but are sufficient to indicate the conditions. The group of north-westerly to south-westerly winds prevails over all others. Expressing these Tarraleah results in terms of conditions at Lake St. Clair, two points in topography must be borne in mind:—

1. Although the situations are topographically similar, the contours are such that winds from the west and south-west sector would be slightly more southerly at Tarraleah than at Lake St. Clair.
2. As the lake runs practically north-south between mountain ranges rising 2000 ft. above it, there is a tendency for winds from the north to north-west sector to sweep down the lake from the north.

Thus, whereas in Table 6, the majority of wind-directions is shown in the north-west to south-west quadrant, for Lake St. Clair this majority is more likely to be in the north to west quadrant. Experience at the lake proved this to be true. Not only were there very few winds from any other direction, but those that most affected the degree of calmness of the lake, and hence, as is considered in Section 9 E, the distribution of the plankton, were from the north and west.

TABLE 7

Tarraleah Wind Velocities (Estimated) Beaufort Scale

	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1937—													
0	13	22	21	21	22	27	17	21	12	15	16	8	215
1	2	2	0	1	0	0	1	2	4	8	3	6	29
2	4	2	2	2	2	1	2	3	6	4	3	7	38
3	3	0	1	3	2	0	2	1	6	3	2	4	27
4	2	0	2	1	4	2	4	1	1	0	1	3	21
5	2	0	1	0	1	0	1	3	0	0	1	2	11
6	5	2	3	2	0	0	3	0	0	0	1	1	17
7	0	0	1	0	0	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	0	0	0	1	0	1
	31	28	31	30	31	30	30	31	29	30	28	31	360
1938—													
0	14	4	0	0	0	11	13	7	10	8	5	10	82
1	4	4	18	12	14	4	7	5	4	4	6	5	87
2	2	6	6	8	9	3	4	5	6	5	5	3	62
3	3	8	0	2	5	4	0	3	0	5	2	2	34
4	3	3	2	2	1	3	2	3	1	2	5	4	31
5	2	0	3	3	1	0	0	3	2	1	1	3	19
6	0	0	0	0	0	0	0	1	1	0	0	0	2
7	0	0	0	0	0	0	0	0	2	0	1	1	4
8	1	0	0	0	0	0	0	0	0	1	0	0	2
	29	25	29	27	30	25	26	27	26	26	25	28	323
1939—													
0	9	16	14	14	18	21	25	26	19	26	8		196
1	8	5	6	2	6	1	0	0	1	0	0		29
2	3	1	5	4	3	0	0	0	0	0	4		20
3	4	1	1	1	0	1	0	1	3	4	0		16
4	3	0	0	1	1	1	1	0	1	1	3		12
5	0	1	1	1	1	0	0	0	0	0	6		10
6	0	0	0	0	0	0	0	0	1	0	4		5
7	0	0	0	0	0	0	0	0	0	0	1		1
8	0	0	0	0	0	0	0	0	0	0	1		1
	27	24	27	23	29	24	26	27	25	31	27	Total for 11 months.	290

Analysis of wind velocity table—

0-4 = Calm to moderate breeze, i.e., up to 16 m.p.h.

5-8 = Fresh breeze to fresh gale, i.e., up to 41 m.p.h.

TABLE 8

Percentages of the Above.

Scale No.	1937	1938	1939
0-4	91·7%	91·6%	94·1%
5-8	8·3%	8·4%	5·9%

The following table shows the directions of the few winds which exceeded 16 miles per hour:—

TABLE 9

Wind	1937	1938	1939	Total
N.	1	0	(11 months)	1
N.W.	0	9	8	17
W.	20	15	7	42
S.W.	7	2	2	11
S.E.	1	0	0	1
N.E.	1	1	0	2
Total	30	27	17	74

This demonstrates that the most frequent winds are also those which blow with the greatest force in this area.

E. SUNLIGHT

No measurements as to the duration of sunlight were made at either Tarraleah or Derwent Basin, but during visits personal observations were made of the percentage of cloud at the time of each collecting trip. These are dealt with later in the report.

The following table gives an analysis of the cloud reports, most of them from Tarraleah, but the later ones from Lake St. Clair. For some of these months, complete records were not available, some figures from each of the abovementioned stations being given. These have been used to give some indication of the amount of cloud obscuring the sky, at the time on each day when the observations were made.

TABLE 10

Monthly Analysis of Cloud Percentage at 9 a.m. Tarraleah (some, 1939, at Lake St. Clair).

	J	F	M	A	M	J	J	A	S	O	N	D
1937—												
Average Daily Cloud %	68	52	55	55	75	50	70	55	71	67	54	79
Days 100%	12	4	5	10	13	9	5	11	13	12	12	16
Days 0%	2	6	4	6	1	6	2	8	3	4	10	1
Total Recorded Days	31	28	31	30	31	*30	30	31	29	30	28	31
1938—												
Average Daily Cloud %	56	64	55	61	47	71	73	71	63	72	60	58
Days 100%	9	9	2	0	0	12	14	13	8	12	8	8
Days 0%	7	2	3	4	8	2	4	6	4	2	4	3
Total Days Recorded	29	25	29	27	29	25	26	27	26	26	25	28
1939—												
Cloud	43	48	59	*71	69	93	82	98	83	72	71	
Days 100%	6	9	12	14	17	19	18	24	18	*17	14	
Days 0%	9	9	7	4	6	0	3	1	3	3	4	
Total Days Recorded	27	24	27	24	29	24	26	26	25	31	27	
1937-39—												
Average	56	55	56	62	64	71	75	75	72	70	62	69
	J	F	M	A	M	J	J	A	S	O	N	D

* After March, 1939, the figures are almost exclusively from Lake St. Clair.

It must be remembered that these figures have been compiled from records made at 9 a.m. each day, when morning mists, especially at this altitude, may not have cleared away. In general, therefore, it would appear that there is ample sunlight to favour the growth of aquatic plants, especially as the water is usually crystal-clear, allowing penetration of bright sunlight to a good depth. There is a direct connection between the surface zoo-plankton catch and the percentage of cloud under normal weather conditions. This is dealt with in Section 9 E.

F. CHEMICAL ANALYSIS OF THE WATER

Frequent analyses of the water were undertaken, especially with regard to certain features once a general analysis had been completed. These results are appended in succeeding sections, together with some comments as to methods. The following table gives a summary of the main constituents disclosed in the general analysis.

TABLE 11

Chemical Analysis of Lake St. Clair Water in Parts per Million

Substance	Content	Date of Taking Sample
Total solids	40	July, 1937
Ammonia (Free & saline)	negligible	July, 1937
Nitrates and nitrites	0·00	July, 1937
Mineral constituents and metals	Sulphate	July, 1937
	Fe, Mg.	July, 1937
Oxygen dissolved	10·7	Nov., 1937
Combined Chlorine	1·93	Feb., 1939
Hardness Temporary	7·8 pts. $CaCO_3$ per m.	April, 1939
Hardness Permanent	45·0 pts. $CaCO_3$ per m.	April, 1939
Phosphorus Soluble	0·00	Aug., 1940
Silica	1·61	Aug., 1940

G. SOLIDS IN SOLUTION AND IN SUSPENSION

1. *Total Solids*

Two tests were made, in 1937 and in 1940 respectively, giving similar results—

July, 1937. 40 mgs. per litre.
June, 1940. 31 mgs. per litre.

The dissolved mineral solids are present, therefore, within satisfactory limits.

2. *Inorganic Suspended Matter*

March, 1938. 0·1 mg. per litre.

This result seems very low, especially when compared with November, 1940, but the conditions were such as to reduce suspended matter to a minimum. After four days of fine weather and with only 'light air' the lake was the calmest it had been for months.

3. *Total Suspended Matter*

November, 1940. 167 mgs. per litre.
Made up as follows:—

Organic suspended matter, 1 mg. per litre.
Inorganic suspended matter, 166 mgs. per litre.

The lake was calm at the time the sample was collected, but, although there had been little rain during the previous week, westerly winds up to 30 miles per hour had been blowing for two days immediately preceding the work, and this, no doubt, caused an increase in suspension of inorganic matter.

The total suspended matter is in this case rather high, but it obviously varies with weather conditions.

H. DISSOLVED OXYGEN

For the samples, special bottles were obtained from Norway. They were fitted with spring clips to prevent any movement of the stopper. Care was taken to avoid trapping any bubbles when filling the bottles, each of which had a certified capacity.

Winkler's method was employed for the chemical determination, which was preceded on each occasion by a preliminary determination of oxygen dissolved in the reagents.

TABLE 12

Dissolved Oxygen

Nov., 1937	Surface	10·7 mgs./litre	
Nov., 1940	Surface	10·6 mgs./litre	Temp. 12·8°C.
	7·5 metres	12·05 mgs./litre	9·32°C.
	15 metres	11·37 mgs./litre	8·35°C.

The results suggest that there is little change in the quantity of oxygen, which is present in ample quantity for fresh-water life. The higher results for depth samples may be due to the fact that these samples had to be transferred from the depth water-bottle to the sampling-bottle, the consequent agitation, perhaps, dissolving a little more air. In addition, the lower temperature favours the dissolving of more oxygen.

I. FREE CARBON DIXOIDE

Seyler's method was used (Sutton (1924)), the water being titrated with $\frac{N}{20}$ sodium carbonate using phenolphthalein as indicator. The samples were taken in the same bottles as for dissolved oxygen, and the same remarks about the depth samples may apply. The following were the results:—

Nov., 1940	Surface	3·19 mgs./litre	Temp. 12·8°C.
	7·5 metres	3·03 mgs./litre	9·32°C.
	15 metres	3·41 mgs./litre	8·35°C.

Here, again, there would appear to be little difference between surface and depth conditions.

J. DETERMINATION OF OXYGEN ABSORBED

TABLE 13

Oxygen Absorbed in Four Hours at 80°F. (in Parts per 100,000).

July, 1937	0·024
November, 1937	0·020
March, 1938	0·024
July, 1938	0·022
February, 1939	0·021
April, 1939	0·022
August, 1940	0·020
Average	0·021

The method adopted for the determination of oxygen absorbed was that outlined by Sutton (1924), using potassium permanganate. Haig Johnson (Ainsworth-Mitchell (1931)) refers to the 'regrettable absence of uniformity amongst the methods in vogue'.

The table shows that the quantity of oxygen absorbed varied very little over the period of the tests. The average of 0·021 parts per 100,000 is a low one compared with results obtained in some New Zealand streams (Phillips (1931)), and should be quite favourable for fish-life.

K. Determination of Combined Chlorine

Mohr's method was used and gave reasonably satisfactory results after the initial difficulties had been observed and overcome.

Table 14

Combined Chlorine in Milligrams per Litre (parts per million)

Date	1937		1938				1939		1940			Aver.
	26 July	21 Nov.	20 Mar.	20 Apr.	16 May	16 July	26 Feb.	13 Apr.	17 May	16 Aug.	30 Nov.	
Surface	1·42	1·42	3·19	1·42	3·19	3·56 / 3·80	1·93	0·92	1·93	2·84	3·41	2·34
6 metres..							1·56	0·99				1·28
7·5 metres											3·19	3·19
9 metres			2·84	1·93								2·39
15 metres							1·28	1·07			3·19	1·85
18 metres			3·19	3·19		4·26						3·55
30 metres							1·2	0·92				1·06

Owing to the small quantity present in the water, a fractional error in the titration would make a considerable difference in the results. Most authors consulted did not give special methods for the detection of small quantities of chlorine. From the above table, therefore, it would appear that there is little, if any, difference between the amount of combined chlorine at the surface, and at depths up to 100 feet (30 metres).

L. pH Value (Hydrogen Ion Concentration)

The method used for this determination was changed more than once owing to the original apparatus going out of order. The figures for May, June, and August, 1937, were determined by means of the electrometric method, using a quinhydrone electrode. Of the remaining figures, those given to the second decimal place were determined with the Du Bosc comparator, and the others by the less accurate colorimetric method using the B.D.H. universal indicator. These latter could be done at the lake-side, but the remainder had to be done at Hobart, where the apparatus was.

For transporting the water a special reagent bottle was carried in a small wooden felt-lined case. This could be locked and despatched by service-bus or lorry in safety. When water samples were wanted, other than during a collecting trip to the lake, they were obtained by the National Park ranger in this bottle and forwarded to Hobart, where the test was made as soon as possible after arrival.

The following table shows the pH values obtained during 1937 to 1940:—

TABLE 15

pH Values (Surface Water)

Month	1937	1938	1939	1940	Average
January		6·6	—	—	6·6
February		6·5	6·4	6·22	6·4
March		6·6	—	—	6·6
April		6·6	6·42	—	6·5
May	6·62	6·6	6·4	6·27	6·5
June	6·40	—		6·21	6·3
July	—	6·5		—	6·5
August	6·58	6·4		6·30	6·4
September	6·6	—		—	6·6
October	6·5	6·6		—	6·6
November	6·5	—		6·33	6·4
December	6·6	6·4			6·5

It will be observed that during the first three years (when all the quantitative plankton work was done) the pH did not change to any marked degree, although there is, perhaps, a slight downward trend. By 1940, however, after a gap of eight months, when the writer was engaged in other work at Great Lake, a considerable relative decrease in pH value was recorded, and this remained in evidence for the remainder of that year. It seems significant that the gradual change in pH value, with increasing acidity, followed the raising of the lake-level by the Hydro-Electric Commission in connection with its Tarraleah power scheme.

There is a slight annual variation, the value usually being a little lower during the winter months. The range is as follows:—

1937. 6·4 to 6·62.
1938. 6·4 to 6·6.
1939. 6·4 (only three readings).
1940. 6·21 to 6·33.

Depth Readings of pH

The following table shows the pH values of samples obtained at various depths:—

TABLE 16

pH at Depths

Date	18.3.38	20.4.38	16.7.38	31.8.38	26.2.39	13.4.39	20.5.39	30.11.40
Metres								
0	6·6	6·6	6·5	6·4	6·4	6·42	6·4	6·33
6					6·5	6·42	6·53	
7·5								6·24
10							6·45	
15				6·4	6.6	6·45		6·23
26				6·4				
30	6·7	6·4			6·7	6·49		
38				6·4				
60		6·6	6·6					

There is little variation as depth increases; the earlier figures (using B.D.H. universal indicator) show a fairly close correspondence, which is confirmed by the later readings (13.4.39 onwards) with the more accurate Du Bosc comparator.

Effect of pH on the Copepoda

The pH value does not directly affect the inhabitants, which are tolerant of changes in pH. Extreme variations may cause death, but usually only in small pools. This was stated by Saunders (1926). As the variation in Lake St. Clair is comparatively small, and the water volume large, the finding suggests that the changes observed would not have had an adverse affect on the plankton. Penelope M. Jenkin (1936) mentions that few species of Copepoda were obtained from the alkaline lakes in Kenya. Lowndes, A. G. (1936-1937), in commenting on the Cambridge Expedition to East African lakes, says that some Copepoda existed in water of pH 2·5 to 7·8 and in salt or fresh water. It would seem, therefore, that the variation in pH has no direct influence on the Copepoda. This conclusion is examined later in connection with the quantitative measurement of the plankton.

Effect of pH on Fish

The general conclusions of other writers suggest that trout favour water with a high pH, and that lack of food does not account for smaller fish in acid waters as the stomach contents are greater (Southern, 1935) (Frost, 1939). These findings, however, are for English and Irish conditions. J. S. Phillips (1931), discussing New Zealand trout, says that low temperatures make acid waters more suitable for trout. Being a high-land lake, St. Clair fulfils this requirement, and the pH readings are substantially the same as those obtained during 1939-1940 at Great Lake (6·35 to 6·67)—the latter lake being renowned for its trout-fishing—although its altitude is 1000 feet above that of Lake St. Clair and its waters therefore colder at times. (A similar paper dealing with the findings at the Great Lake will be prepared later.)

Note on Method

In order to avoid inaccuracies in measurement due to the weakly buffered lake water, it was intended to use the electrometric method throughout, but when this apparatus went out of order the colorimetric method became obligatory. Tengco's paper (1939) states that the adjustment of indicator solutions is not as necessary as has been claimed, but that the colorimetric values were usually 0·2 to 0·4 pH units lower than with the glass electrode. He also advises a preliminary comparison between the two methods. In the present work this requirement was fulfilled to the extent that the electrometric readings, which were the first obtained, were a guide to the later ones using the B.D.H. universal indicator, and these in turn checked with the later colorimetric measurements made with the Du Bosc comparator.

Red Copepods

Ueno (1939) comments on the red colour exhibited by Copepods in high altitudes, and quotes *Acanthodiaptomus yamanacensis* as being red in acid waters (pH4 to 6·8), but usually not red in alkaline waters. He found that the pigment Astacin ($C_{40}H_{48}O_4$) an acid carotene was responsible, and concludes that the Copepod gets energy when the β-carotin ($C_{40}H_{56}$) is oxidised to Astacin in the body.

Red Copepods occur in some cold mountain lakes in Formosa and Japan. In these particular lakes the water is usually acid.

From the beginning of the present study it has been noticed that some specimens of *Boeckella longisetosa,* instead of being green, were from brownish-red to red in colour. At 9 a.m. on the 18th May, 1937, for example, green colours dominated, due to the catch containing 60 per cent of Cladocerans and Cyclopoida, but the 3 p.m. catch contained 5:1 in favour of the reddish-brown Calanoida.

As the Lake St. Clair pH readings varied from 6·21 to 6·62, it would be interesting to know whether the cold acid mountain waters of Tasmania, too, are responsible for the production of the pigment Astacin in Copepods. *Boeckella rubra,* which Smith (1909) found in the cold mountain tarns of Mounts Hartz and Read, may be another example of the same type, as it is a bright red colour. (The depth of these lakes should be borne in mind.) Fairbridge (1945) discusses the possibility of coloration of *Boeckella opaqua* Fairbridge being a protection against intense light in shallow pools. This would not apply in Lake St. Clair where the depth is measured in hundreds of feet, and, in addition, red Copepods were taken in mid-winter when the intensity of light is at a minimum. In August, 1937, for example, the noon catches showed more red Copepods at a depth than at the surface, so the red pigmentation can hardly be for protection against sunlight.

7. The Fauna of the Lake

A. Animals Caught in Lake

The following is a list of the various animals seen or caught in the waters of Lake St. Clair:—

(1) Floating population (plankton)—

(A) Copepoda

(*a*) Calanoida (Family Centropagidae)—

Boeckella longisetosa Smith, was very plentiful.

(*b*) Cyclopoida (Family Cyclopoidae)—

Cyclops (probably *C. albicans* Smith), relatively few.

Cyclops—a species not previously recorded from Tasmania—very few.

(B) Cladocera

Daphniidae

Ceriodaphnia hakea Smith.

Ceriodaphnia planifrons Smith.

Bosmina sorelli Smith.

Bosmina rotunda Smith.

(2) Free swimming—

Fish (seen, but not caught)

Platypus (seen, but not caught)

(3) Bed scramblers—

Cypris (one specimen only). Ostracoda.

Shrimps—

Anaspides tasmaniae Thomson. Anaspidacea.

Chiltonia australis (Sayce). Amphipoda.

Gammarus sp.

Phreatoicus sp. Isopoda.

Crayfish. *Astacopsis tricornis* Clark. Decapoda.

Snails. Small f.w.sp. Mollusca.

Insect larvae. Caddis fly. Dragon fly. Stone fly. May fly.

Arachnida. Water mites.

Flatworms. Planarians. Platyhelminthes.

As mentioned previously, the main study centres around the plankton Crustacea. Of these, the main member was *Boeckella longisetosa*. Of this genus, Geoffrey Smith (1909) says that it is typical of the cold highland tarns of Tasmania and characteristic of the temperate parts of the Southern Hemisphere, except South Africa. (One species of the genus has since been found in Mongolia.) Also characteristic are the genera *Chiltonia* and *Astacopsis* (or close relatives in other parts of the Southern Hemisphere).

B. Sample of Collecting Records

In order to make the figures given in succeeding sections clear, the following sample is given from the actual records made during and after each trip to the lake:—

Surface

Nov. 20th, 1937	Copepoda		Cladocera	Eggs			Index of Plankton Total Catch	Remarks
	Calanoida a.	Cyclopoida b.	c.	Cal.	Cyc.	Clad.	d.	
0.00 a.m.	35	2	4	—	—	1	8·2	98% cloud. Moon. Calm
3.00	29	2	9	1	1	1	8·0	99% cloud. Moon. Calm
6.00	32	1	3	1	1	1	7·2	Sunrise 5.00 a.m. 100% cloud. Calm
9.00	20	2	4	1	—	1	5·2	20% cloud. Slightly choppy. N. Wind
12 noon	9	0	1	1	—	—	2·0	Fine. Sunny. Slight ripple
3.00 p.m.	6	2	1	—	—	—	1·8	As for noon
6.00	40	3	7	—	1	1	10·0	Sunset. W. Wind. Confused ripples but not rough
9.00	37	5	5	—	—	1	9·4	Moon not yet risen. Fairly calm. Occasional gusts
Total	208	17	34				51·8	
Average	26·0	2·1	4·3				6·5	

Each of the figures in columns Copepoda, Cladocera and Eggs is given as a total count over five squares of the counting slide (see Section 5, G. Method (2)). These are averaged at the bottom of each column and used as an indication of the groups of plankton Crustacea present in the lake for the month of November.

As an indication of the total number of plankton in the surface waters at each of the given times, the horizontal total is divided by five, giving the average number of plankton Crustacea per square of the counting slide. From each such index the total catch may be calculated as follows:—

e.g., at 0·00 a.m. Index figure 8·2.

$\therefore$ Total catch $= 8{\cdot}2 \times 10 \times 707 = 57{,}974.$

(One-tenth of the catch was used in counting-dish, which covered 707 squares of the counting-slide.)

8. Seasonal Distribution of the Plankton

A. The Plankton as a Whole

In order to study this, Table 17 was drawn up, showing the summary of the monthly plankton catches in horizontal hauls at the surface and at a depth of 15 feet. The mean of these for each month is given in column 'e'.

The results are shown graphically in fig. 5, reading from the right-hand axis. The graph is taken for twelve months only from May, 1937, the investigations after that time serving as a check on the results obtained over this period. It will be seen from the table that there is a correspondence between the catches in the same month of succeeding years.

TABLE 17

Summary of Monthly Plankton Catches (Horizontal Hauls)

a. Calanoida.
b. Cyclopoida.
c. Cladocera.
d. Total Plankton (Index No.).
e. Mean Surface and Depth.

Date	Surface				Depth (15 feet)				
	a	b	c	d	a	b	c	d	e
1937—									
18-19 May	14·4	2·9	7·8	5·0	(19 June)				5·0
26 June	8·3	0·5	2·3	2·2	22·1	1·4	5·3	5·8	4·0
24 July	23·0	0·5	2·0	5·1	21·3	0·4	1·8	4·7	4·9
27 August	32·5	3·5	1·0	7·4	36·9	1·6	6·0	8·9	8·2
23 September	28·5	2·9	1·9	6·7	17·5	3·3	3·0	4·8	5·8
23 October	14·3	1·0	1·1	3·3	24·9	1·7	2·1	5·7	4·5
20 November	26·0	2·1	4·3	6·5	43·9	3·0	4·4	10·3	8·4
21 December	27·3	0·5	11·9	7·9	36·9	1·1	25·5	12·7	10·3
1938—									
26 January	17·6	0·0	68·3	17·2	17·3	0·1	75·7	18·6	17·9
11 February	4·4	0·6	47·3	10·5	4·6	0·8	43·1	9·7	10·1
18 March	53·3	1·3	14·0	13·7	50·9	2·8	19·8	14·7	14·4
20 April	4·6	2·5	10·5	3·5	9·6	3·0	10·8	4·7	4·1
16 May	10·8	1·0	9·3	4·2	14·3	0·8	6·8	4·4	4·3
16 July	2·8	0·3	5·3	1·7	2·0	0·3	3·0	1·1	1·4
30 August	6·8	3·0	6·3	3·2	13·0	3·5	9·8	5·3	4·3
*18 October	13·3	2·5	1·8	3·5	16·0	2·3	4·3	4·6	4·1
3 December	25·5	3·0	12·3	8·2	41·8	4·3	15·8	12·4	10·3
1939—									
25 February					16·4	0·2	66·4	16·6	16·6
*12 April	25·0	2·8	11·8	7·9	47·5	4·0	19·5	14·2	11·1
20 May					13·0	1·0	5·5	3·9	3·9

* No. 1 mesh. Surface.

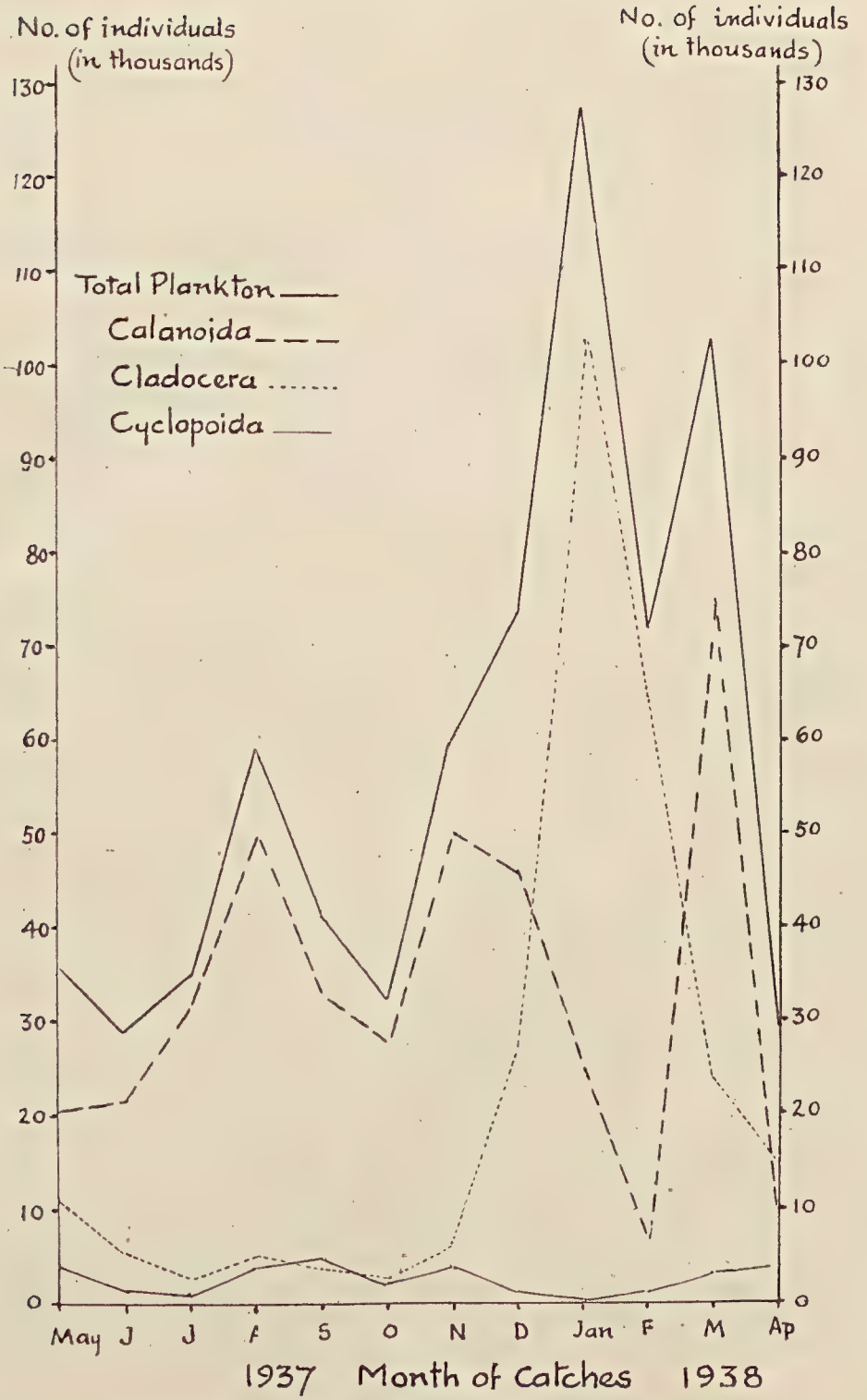


FIG. 5.—Seasonal distribution of the plankton. Mean of surface and depth horizontal monthly catches (see Tables 17 and 18).

During the first twelve months, eight tows per day were carried out on one day each month. Thereafter less tows per day (usually four) were carried out, so that the figures given from May, 1938, onwards are the average of a smaller number of tows, from which the same accuracy as for the first year cannot be expected. However, useful comparisons for checking purposes can still be made.

Plankton totals represented by values given in Tables 17 and 18.

Groups (a, b, c). Total $= \frac{a}{5} \times 10 \times 707$.

Averages (d, e). Total $= d \times 10 \times 707$.

N.B.—a, b, and c give total count over five squares, averaged out for the number of catches taken during each collecting trip to the lake.

TABLE 18

Mean of Surface and Depth Monthly Horizontal Catches

Month	a Calanoida	b Cyclopoida	c Cladocera	
1937—				
May	14·4	2·9	7·8	
June	15·2	1·0	3·8	
July	22·2	0·5	1·9	
August	34·7	2·6	3·5	*Percentages* (12 months from May, 1937)
September	23·0	3·1	2·5	
October	19·6	1·4	1·6	Copepoda 61·2% Cladocera 38·8%
November	35·0	2·6	4·4	
December	32·1	0·8	18·7	(Calanoida 57·0%) (Cyclopoida 4·2%)
1938—				
January	17·5	0·1	72·0	
February	4·5	0·7	45·2	
March	52·1	2·1	16·9	
April	7·1	2·8	10·7	
May	12·6	0·9	8·2	
July	2·4	0·3	4·2	
August	9·9	3·3	3·2	*Percentages* (for period May, 1938. to April, 1939)
October	14·7	2·4	3·1	
December	33·7	3·7	14·1	Copepoda 53·9% Cladocera 46·1%
1939—				(Calanoida 48·4%) (Cyclopoida 5·5%)
February	16·4	0·2	66·4	
April	36·3	3·4	15·7	
May	13·0	1·0	5·5	

The minimum average catch of about 28,000 ' plankters ' was recorded in June and the maximum of over 120,000 in January.

In the succeeding year, remembering that trips to the lake and the number of tows per day during those trips were not quite so frequent, the minimum of 10,000 plankters was recorded in July and the maximum of about 117,000 in February.

Thus there is a well-marked autumn or early winter minimum and a summer maximum. A small mid-winter maximum, followed by a slightly higher spring minimum, separates these major points.

Summarizing:—

Small mid-winter maximum.

Large summer maximum.

With almost equal minima in late autumn and spring respectively.

The part played by the various groups in causing these maxima and minima is examined in the succeeding sections, Table 18 having been drawn up for this purpose.

B. Seasonal Distribution of the Calanoid Copepoda

Boeckella longisetosa was the only species. The seasonal distribution of the group is given in Table 18 and graphically in fig. 5. The Calanoida constitute 57 per cent of the plankton, so that their variations exert a profound influence on the total plankton.

The Calanoida are definitely '*perennial planktonts*', their numbers remaining reasonably large throughout the year (minimum 6400). In this connection the much lower minimum of 3400 in July, 1938, should be noted.

Maxima occurred in August (49,000), November (49,500), March (73,000). At the March maximum the Calanoida constituted 72·4 per cent of the total plankton.

Minima occurred in October (28,000), February (6400), and April (10,000).

In the 1938-39 period maxima were recorded in December and April (51,000) with minima in July (3400) and February (23,000).

These do not correspond with the figures of the previous year as well as do those of the Cyclopoida, even after allowing for the reduced number of hauls made during 1938-39.

There would appear to be spring and autumn maxima with summer and winter minima, but these are not clearly defined and the Calanoida on the whole are more uniformly distributed throughout the year than are the other two groups. The low July, 1938, minimum is entirely responsible for the very low total plankton of 10,000 since the other groups were present in normal numbers as compared with the previous year.

C. Seasonal Distribution of the Cyclopoid Copepoda

Of these, the smaller species provisionally identified as *Cyclops albicans* was more plentiful, whilst a large species, probably of the same genus, was much less frequent. The graph, fig. 5, shows the seasonal distribution of the Cyclopoida for 1937-38. It will be noticed from Table 18 that this group represents only about 5 per cent of the plankton Crustacea.

Maxima occurred in May (4100), September (4400), and November (3700).

Minima occurred in July (700), October (2000), and January (140).

As a similar series of changes occurred during 1938-39, it may be stated that there are approximately equal autumn and spring maxima with winter and summer minima.

The October minimum is only relative, but should not be completely ignored as it occurred in both years.

Compared with the range of total plankton the variation in the Cyclopoida is not very great and does not appreciably affect the total.

D. Seasonal Distribution of the Cladocera

Having an annual occurrence of 40 per cent, these Crustaceans, with the Calanoida, constitute the bulk of the plankton, but the annual variation is much greater

than either of the other two groups. Thus in January, 1938, the Cladocera (102,000) comprised 80·4 per cent of the total plankton, whilst in August, 1937 (4900), there were only 8·6 per cent.

It is a remarkable fact that in both 1937-38 and 1938-39 the large Cladoceran population was accompanied by a relatively low occurrence of both groups of Copepoda, especially the Calanoida.

The graph on fig. 5 (from Table 18) shows a very small late winter maximum of 4900 in August and a very large summer maximum of 102,000 in January.

The minima in winter and spring were recorded in July (2700) and October (2300) respectively.

The late winter maximum is so close to the neighbouring minima that the main variations might well be stated as a low winter minimum followed by a high summer maximum.

The corresponding extremes for 1938-39 are very similar, viz.:—

Maxima

Small late winter maximum, 12,000 in August.

Very large summer maximum, 94,500 in February.

Minima

Mid-winter minimum, 5950 in July.
Spring minimum, 4400 in October.

The correspondence in the periods of the extremes is remarkably close in these two years for the Cladocerans, so that, whilst the generalisation stated above may be accepted, the small late-winter maximum in August of both years would appear to have some significance.

E. General Discussion on the Seasonal Planktonic Distribution

The various maximum and minimum catches were further examined in order to determine more precisely which organisms contributed to each extreme.

(1) *Plankton Minimum, June,* 1937

(*a*) *Calanoids.—Boeckella longisetosa* was represented by a few large specimens, females—slightly smaller males, and many smaller specimens—apparently well-developed copepodids. Eggs were plentiful.

(*b*) *Cyclopoids.*—Cyclops species. The large species measuring about 2 mms. in length was present in small numbers.

(*c*) *Cladocera.—Bosmina sorelli* and *Ceriodaphnia hakea* were present in slightly greater numbers than Cyclops.

(2) *August Maximum,* 1937

(*a*) Boeckella was very numerous. Some fully-grown females and a smaller number of males were observed, but the majority appeared to be copepodids in their later stages. Some eggs were present.

(*b*) Cyclops was represented by the larger species in small but noticeable numbers.

(*c*) The Cladocera were for the most part conspicuous by their absence, being represented by *Bosmina sorelli* (measuring about 0·3 mms.).

(3) *Calanoid Maximum, November,* 1937

(*a*) The Calanoid maximum was caused chiefly by mature species of Boeckella, most of them being females.

(*b*) Cyclops (large) carrying eggs was observed.

(*c*) The Cladocerans were represented by all four species named in 8 (A). *Bosmina rotunda* was present in very small numbers. *Bosmina sorelli* constituted the majority with Ceriodaphnia spp. next.

Eggs.—All the above groups were carrying eggs in November. The number of eggs was at a minimum for all groups from July to October, but thereafter steadily increased into the summer of 1937-38, falling away again by May, 1938.

(4) *Plankton (and Cladoceran) Maximum, January,* 1938

(*a*) Most of the Calanoids were large.

(*b*) Only one Cyclops was seen on the counting squares.

(*c*) The plankton maximum was due almost entirely to the Cladocerans, *Bosmina sorelli,* and *Ceriodaphnia hakea,* with smaller numbers of *C. planifrons.*

(5) *Copepod Minima, February,* 1938

(*a*) The Calanoids were of normal adult size.

(*b*) The Cyclopoida included both large and small species. The 3 a.m. depth catch in this month was unique in that more Cyclopoida than Calanoida were present (ratio 3 : 1).

(*c*) The usual Cladocerans were present.

(6) *Plankton (and Calanoid) Maximum, March,* 1938

(*a*) Boeckella was present in overwhelming abundance. Some were large, and there were many large copepodids. Eggs were plentiful.

(*b*) There were a few large Cyclopoida and rather more smaller ones.

(*c*) The Cladocerans noted were *B. sorelli, C. hakea,* and *C. planifrons,* the two latter with eggs.

F. Nature of the Calanoid and Cladoceran Peaks (1937-38)

(*a*) *Calanoida.*—From fig. 5, observations just reported and the note on the relative numbers of the sexes (Section 9 H) it is possible to form an opinion as to the meaning of the main peaks and troughs in the seasonal variations of the Calanoida.

Eggs, plentiful in May and June, hatched to cause the peak, of juvenile specimens, in August. Then followed a minor trough to the November peak, which consisted chiefly of adult females with some copepodids and a few males.

In January and February, with eggs at a maximum, adults only were present, to cause the summer minimum. These were breeding specimens giving rise to the large summer maximum in March, when many copepodids were accompanied by a few adult females and practically no males.

(*b*) *Cladocera.*—The following is a summary for the four species:—

(i) *Bosmina rotunda,* which was never plentiful, had a maximum in November.

(ii) *Ceriodaphnia planifrons* was most in evidence from November to April.

(iii) *Bosmina sorelli* caused a small maximum in August.

(iv) *C. hakea* and *B. sorelli* reached maxima in January.

(v) No males were observed.

Thus all four species were present in larger numbers during the summer months, *C. hakea* and *B. sorelli* contributing most of the Cladoceran summer maximum. This coincided with the highest mean monthly temperature (57·0°F., see Table 1) for the twelve months (1937-38). The summer maximum in 1938-39 showed a similar agreement with temperature (mean 61·2°F.). Thus the warmer temperatures favoured increased production of Cladocera.

G. Relation between Seasonal Planktonic Distribution and Introduced Fish

(*a*) *Brown Trout.*—The first brown trout hatch out at the time of the August Calanoid maximum and, as they feed on the plankton for only a few weeks, there is ample food available. The Calanoida are so much larger than the Cladocera that the volume of food available from this source in August compares quite favourably with that available in January from the Cladoceran maximum. This applies practically throughout the year as far as the Calanoida are concerned, except, possibly, in February, when, however, the Cladocera are still present in large numbers. The last brown trout hatch out about the middle of September and, therefore, by the end of October, when there is a plankton minimum, will have ceased to feed extensively on the plankton. For the young brown trout, therefore, the supply of food-plankton is ample.

(*b*) *Rainbow Trout.*—The rainbow trout hatch out from during October and November, feeding on the plankton until about the end of the year. They thus arrive when the numbers of Calanoida are increasing from what is only a minimum to substantially higher numbers in November and December, associated with a steady increase in the Cladocera. Thus the food-plankton available has reached very satisfactory proportions.

9. Diurnal Distribution of the Plankton

A. The Plankton as a Whole

Tables 19 and 20 set out the index figures for the total plankton catch at three-hour intervals one day per month for the twelve months from May, 1937.

Depth catches were not taken in conjunction with the surface catches in May, 1937. The other gaps are due to conditions preventing a catch being made, or to the depth net fouling the lake-bed. The letter ' P ' indicates the presence of plankton, but in numbers insufficient for counting by the method adopted.

TABLE 19

Total Surface Plankton—Index No. of Monthly Diurnal Catches

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.	5.2	4.2	4.4	4.8	6.0	2.2	8.2	8.2	19.4	15.6	18.2	7.0	103.4	8.6
3 a.m.	7.2	1.8	6.2	7.8	3.0	5.4	8.0	6.6	15.6	13.6	14.6	4.4	94.2	7.9
6 a.m.	6.2	1.4	7.4	9.6	1.8	0.6	7.2	9.4	13.2	11.6	7·2	4.0	79.6	6.6
9 a.m.	1.0	1.2	1.0	7.8	1.0	4.4	5.2	13.2	22.0	5.8	21.0	1.4	85.0	7.1
12 noon	P	1.2	1.0	1.0	0.4	—	2.0	6.2	10.6	6.2	7.2	1.0	36.8	3.3
3 p.m.	6.6	0.6	2.0	2.6	3.4	4.8	1.8	4.6	—	8.2	7.2	1.0	42.8	3.9
6 p.m.	10.4	4.2	11.8	16.4	27.2	3.4	10.0	11.0	29.6	7.0	18.8	5.4	155.2	12.9
9 p.m.	3.4	3.0	7.0	9.2	10.4	2.2	9.4	4.2	9.8	15.6	15.4	4.0	93.6	7.8

TABLE 20

Total Depth Plankton—Index No. of Monthly Diurnal Catches

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.		4.0	—	5.4	8.6	3.0	5.4	11.2	9.0	17.8	17.8	5.2	87.4	8.7
3 a.m.		3.6	3.8	8.6	3.4	8.4	7.0	8.0	11.8	10.8	11.0	2.0	78.4	7.1
6 a.m.		4.4	3.4	7.0	4.6	4.2	6.4	16.0	24.2	4.6	16.8	5.4	97.0	8.8
9 a.m.		3.4	4.4	8.2	2.2	7.2	13.4	21.4	14.6	10.4	12.4	5.6	103.2	9.4
12 noon		5.0	5.4	9.8	3.8	—	12.4	24.6	23.6	6.4	22.8	4.8	118.6	11.9
3 p.m.		6.8	4.0	12.2	4.4	5.8	15.2	9.8	—	8.2	17.6	4.2	88.2	8.8
6 p.m.		11.8	7.4	12.0	6.4	8.0	14.2	7.6	31.6	8.0	13.2	7.8	128.0	11.5
9 p.m.		7.0	8.8	8.0	4.6	3.6	8.0	3.0	15.6	11.4	5.8	2.4	78.2	7.1

An analysis of these tables is of less value than the examination of the tables following in parts B, C, and D of this section, where are set out the corresponding catches of each group of Crustacea contributing towards the total catches indicated in Tables 19 and 20.

The averages in Tables 19 and 20 are shown in fig. 6 by line graphs, the latter showing diagrammatically how the plankton Crustacea as a whole shunned the surface at midday but congregated there at dusk, with even distribution at midnight.

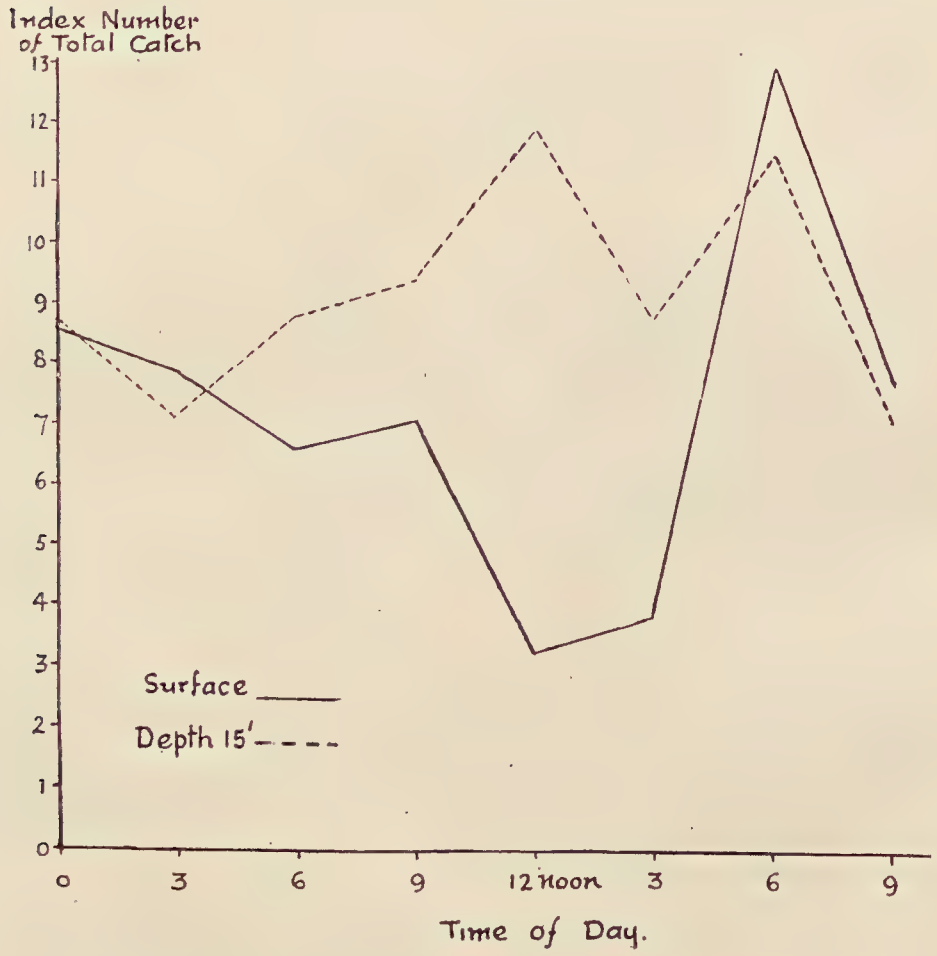


FIG. 6.—Total plankton—Average of diurnal catches over 12 months (see Tables 19 and 20).

The diurnal movement of plankton has been the subject of much investigation by Russell (1925, *et seq.*), Gardiner (1934), Johnson (1938), Shallek (1942, *et seq.*), Pennak (1944), and others. The present investigation was of too wide a nature to make possible detailed findings in this connection, but the observations for surface and depth (15 feet) plankton over so many months make some contribution towards the general pool of knowledge of diurnal migrations.

B. Diurnal Distribution of the Calanoid Copepoda *(Boeckella longisetosa*, Smith*)*

(1) *Annual Mean*

Tables 21 and 22 set out the total count over five squares of Boeckella for each diurnal catch over the same period as already given for total plankton. In fig. 7 these results are shown graphically, whilst fig. 8 compares these results for each of the three plankton groups by block graphs.

Fig. 7.—Diurnal distribution of Calanoida (Boeckella). Annual average for each time of day (see Tables 21 and 22).

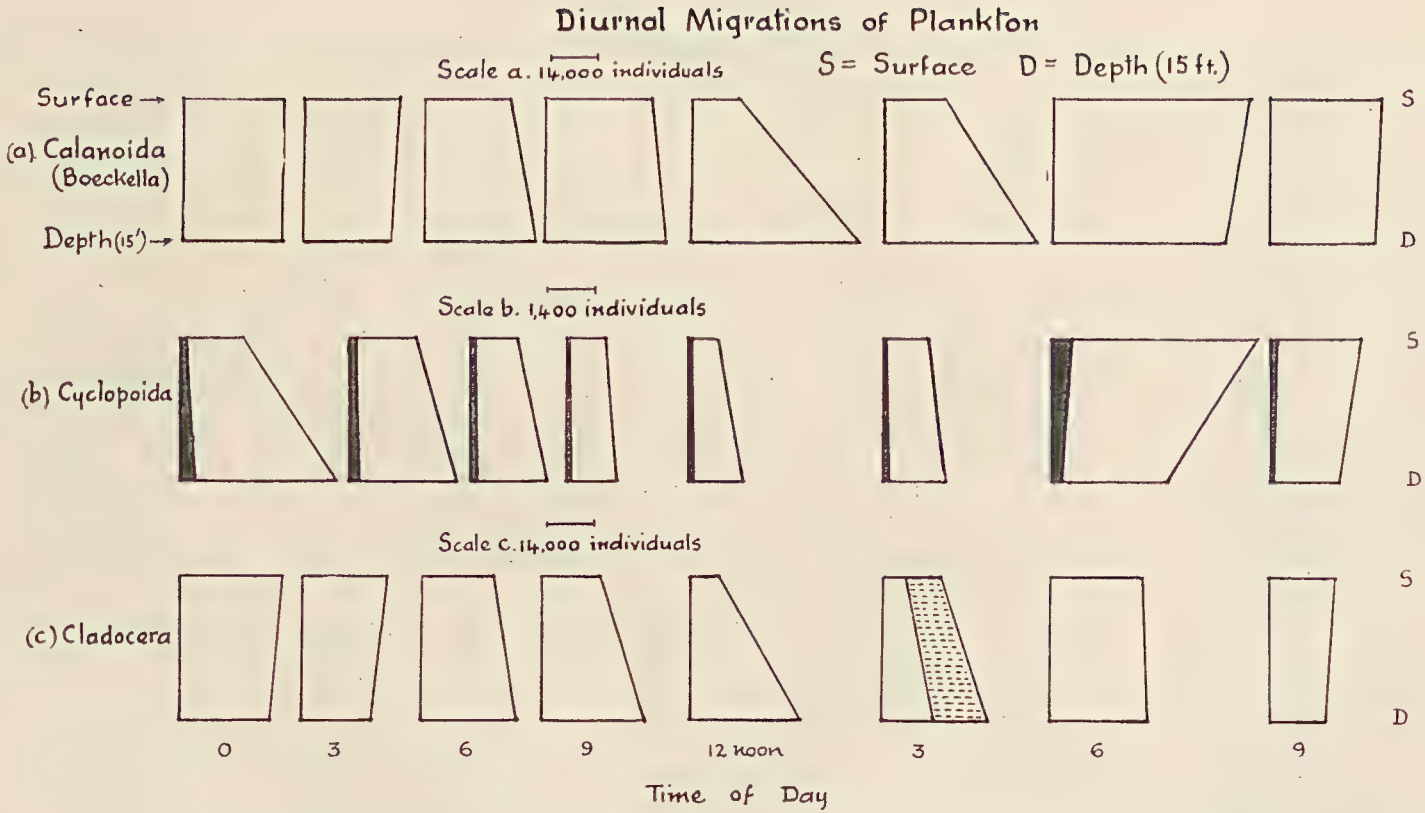


FIG. 8.—Diagrams showing the relative numbers of each plankton group at the surface and at a depth of 15 feet, obtained by averaging the catch for each time shown over a twelve-month period. Note that the scale for the Cyclopoida (*b*) is ten times that of the other two groups owing to the small numbers of the former present. The black portion represents the Cyclopoid catches drawn to the same scale as the other two groups. The dotted portion shown at 3 p.m. for the Cladocera indicates the possible catches, had one important tow not been missed (see Section 9D).

Since Boeckella is the dominant member of the plankton Crustacea, it is not surprising to find that its diurnal distribution closely approximates the migrations indicated already for total plankton—cf. figs 6, 7 and 8*a*.

The distribution may be summarised as follows:—

9 p.m. to 9 a.m., even distribution.

12 noon, minimum at surface.

6 p.m., maximum in the upper layers.

During darkness the results for surface and depth remain reasonably uniform at a figure below the maximum for either. This suggests the even distribution indicated above, especially since the maxima referred to are recorded at one time only, viz., 6 p.m. (surface and depth). Hence at 6 p.m. there is a maximum in the upper layers.

(2) *Optimum Light Intensity*

At 12 noon the depth reading is shown as approaching that of the depth maximum, whilst the surface reading has reached a minimum. Although regular readings at lower depths are not available, it seems reasonable to conclude from these observations that at mid-day Boeckella favours the light intensity at about this depth. Whether the actual depth of the optimum changes with seasonal variations in the intensity of sunlight will be considered later.

TABLE 21

Diurnal Surface Catches of Boeckella

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.	8	20	21	19	26	9	35	27	2	2	78	5	252	21
3 a.m.	26	4	27	32	9	24	29	20	4	1	60	5	241	20
6 a.m.	17	3	33	42	6	2	32	32	22	2	16	4	211	18
9 a.m.	2	3	3	37	3	19	20	49	19	5	105	4	269	22
12 noon	P	4	4	4	1	—	9	22	22	7	33	2	108	10
3 p.m.	29	2	8	12	16	22	6	20	—	4	24	2	145	13
6 p.m.	28	19	56	74	121	15	40	37	30	6	63	5	494	41
9 p.m.	5	11	32	40	46	9	37	11	24	8	47	10	280	23

TABLE 22

Diurnal Depth Catches of Boeckella

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m. ...		11	—	23	33	10	18	39	3	5	63	7	212	21
3 a.m.		12	17	30	12	38	26	22	4	1	32	4	198	18
6 a.m. ...		17	16	30	17	19	25	58	9	1	49	10	251	23
9 p.m. ...		12	17	24	8	31	57	62	4	5	47	8	275	25
12 noon		19	26	41	10	—	57	69	29	11	86	5	353	35
3 p.m. ...		28	18	56	19	25	68	20	—	4	70	10	318	32
6 p.m. ...		53	35	55	24	35	64	18	37	5	46	26	398	36
9 a.m.		25	41	36	17	16	36	7	35	5	14	7	239	22

(3) *Seasonal Changes in Diurnal Movements*

A further examination of Tables 21 and 22 shows that the mean diurnal distribution over the twelve-month period may be considered in two groups:—

1. April to September.
2. October to March.

Tables 23 and 24 give the analyses of the above tables in terms of these two periods. As an indication of the total numbers of Boeckella present in the upper layers, the sum of the surface and depth averages is given in the last column of each table.

TABLE 23

Totals and Averages—Diurnal Recordings of Boeckella
April to September

Surface	Total	Average (S)	Depth Total	Average (D)	Total in Upper Layers (S + D)
0 a.m.	99	17	74	19	36
3 a.m.	103	17	75	15	32
6 a.m.	105	17	90	18	35
9 a.m.	52	9	69	14	23
12 noon	15	3	101	20	23
3 p.m.	69	12	131	26	38
6 p.m.	303	51	193	39	90
9 p.m.	144	24	126	25	49

TABLE 24

Totals and Averages—Diurnal Recordings of Boeckella
October to March

Surface	Total	Average (S)	Depth Total	Average (D)	Total in Upper Layers (S + D)
0 a.m.	153	26	138	23	49
3 a.m.	138	23	123	21	44
6 a.m.	106	18	161	27	45
9 a.m.	217	36	206	34	70
12 noon	93	19	252	50	69
3 p.m.	76	15	187	37	52
6 p.m.	191	32	205	34	66
9 p.m.	136	23	113	19	42

1. *April to September*

The diurnal migration over this period corresponds closely with that of the annual mean (cf. fig. 8 (*a*)), showing a definite surface minimum during the early daylight hours to noon and a very definite maximum at 6 p.m. The fact that the minimum occurs in the morning suggests that thereafter the animals have adapted themselves to the light intensity nearer the surface, moving upwards as the light fades at dusk. From then on they start sinking until evenly distributed.

Summarising:—

0-9 a.m.	Even distribution.
9 a.m.-12 noon	Minimum at surface.
6 p.m.	Maximum in the upper layers.

As:—(i) The depth reading at noon is only 51 per cent of the depth maximum at 6 p.m.; and

(ii) The total numbers of Boeckella in the upper layers at noon is only 26 per cent of those at 6 p.m.,

then it is obvious that the autumn and winter broods of Boeckella prefer a mid-day light intensity at a depth lower than 15 feet.

2. *October to March*

These figures (cf. fig. 8 (*a*)) show that diurnal migrations of Boeckella are less marked during the spring and summer months and the correspondence with the annual mean is not nearly as marked as during the autumn and winter months. There is no definite minimum in the upper layers, whilst maxima are recorded in late morning and at dusk.

The tendency seems to be as follows:—

9 p.m. to 9 a.m.	Even distribution.
9 a.m. to 12 noon	Maximum in upper layers.
12 noon to 3 p.m.	Sinking to avoid strong summer sun.
6 p.m.	A near-maximum in the upper layers.

The sinking movement seems to affect only the near-surface population, as at 3 p.m. there are two-and-a-half times as many at 15 ft. depth as at the surface. Soon afterwards, as the sun's rays become less direct, a movement towards the surface sets in. Once again, therefore, as suggested by the annual mean, it seems that the region of optimum light intensity is in the vicinity of 15 ft. depth. From the groupings it would appear that the spring and summer broods prefer a higher light intensity than the autumn and winter broods.

C. Diurnal Distribution of the Cyclopoid Copepoda

Tables 25 and 26 and figs 8 (*b*) and 9 set out the diurnal results for twelve months for the Cyclopoida. The relatively small numbers present make analysis more difficult than in the other groups.

All reasonable maxima in the surface catches were recorded at 6 p.m. (one at 9 p.m.), i.e., at dusk, whereas the minima were apparently at about mid-day.

At 15 ft. depth (table 26) the minima were usually recorded between 9 a.m. and 3 p.m., i.e., during daylight, whilst the maxima were recorded between 6 p.m. and 3 a.m., i.e., during hours of darkness. This was especially noticeable during the spring and summer months (when dusk is later than 6 p.m.), the maxima being more marked and all between midnight and 3 a.m.

Adding the averages for surface and depth we get:—

0 a.m.	4·5	
3 a.m.	3·6	These figures show once again:—
6 a.m.	2·6	A minimum in the upper layers at noon.
9 a.m.	1·8	A maximum at 6 p.m.
12 noon	1·7	A tendency towards even distribution during darkness.
3 p.m.	2·2	
6 p.m.	6·7	
9 p.m.	3·4	

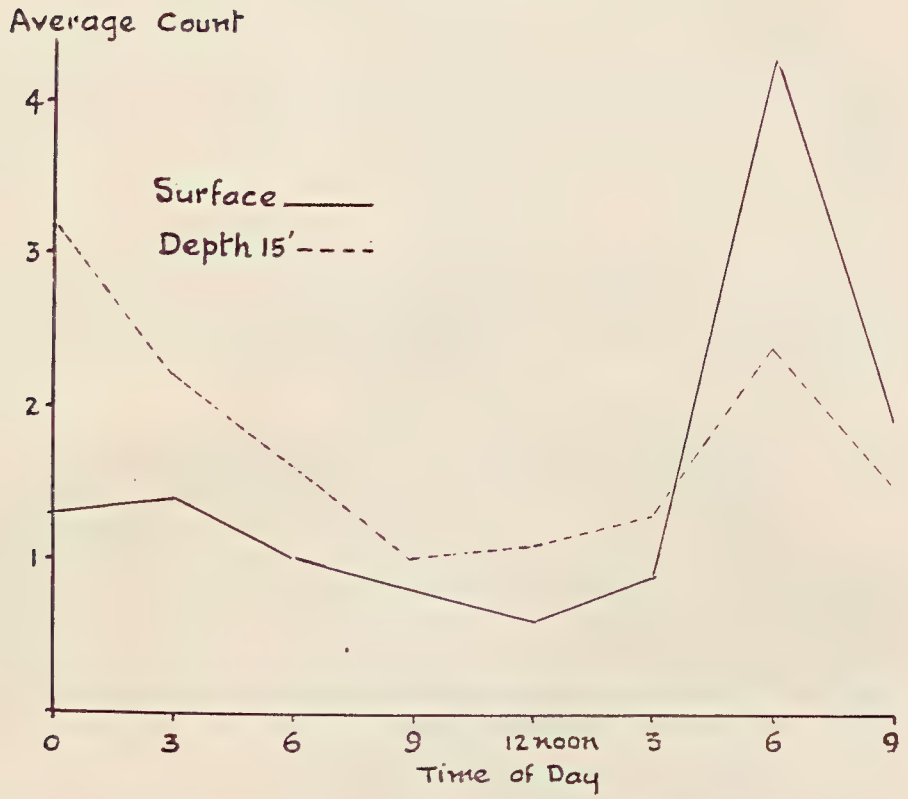


FIG. 9.—Diurnal distribution of the Cyclopoida. Annual average for each time of day (see Tables 25 and 26).

One striking feature of fig. 9 is that the surface and depth graphs follow the same general directions, whereas they take the opposite directions during daylight for the Calanoida (fig. 7) and for the Cladocera (fig. 10). On the average, from midnight to 3 p.m., the surface reading is always less than the depth reading, and even when between 3 p.m. and 6 p.m. the graphs cross for the 6 p.m. surface maximum, the depth reading shows a similar, though pronounced, upward trend; both fall again immediately.

The inference from these graphs is that the Cyclopoida dislike strong sunlight more than the other groups, and that their optimum conditions are found in the deeper water during daylight.

TABLE 25

Diurnal Surface Catches of Cyclopoida.

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.	2	0	0	3	2	1	2	1	0	1	1	2	15	1.3
3 a.m.	2	1	1	5	2	1	2	0	0	1	1	1	17	1.4
6 a.m.	1	0	1	5	1	1	1	0	0	1	0	1	12	1.0
9 a.m.	1	1	0	1	1	1	2	0	0	1	0	1	9	0.8
12 noon	P	1	0	1	0	—	0	0	0	0	2	3	7	0.6
3 p.m.	1	0	1	1	0	1	2	0	—	0	2	2	10	0.9
6 p.m.	14	1	1	7	12	1	3	1	0	0	4	8	52	4.3
9 p.m.	2	0	0	5	5	1	5	2	0	1	0	2	23	1.9

TABLE 26

Diurnal Depth Catches of Cyclopoida

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.		1	—	2	7	3	7	3	1	1	3	4	32	3.2
3 a.m.		2	0	2	3	2	4	1	0	3	4	3	24	2.2
6 a.m.		1	1	2	4	1	2	1	0	1	1	4	18	1.6
9 a.m.		1	1	0	1	1	2	0	0	0	4	1	11	1.0
12 noon		1	0	1	1	—	3	2	0	0	2	1	11	1.1
3 p.m.		1	0	1	1	1	1	1	—	0	3	4	13	1.3
6 p.m.		2	1	2	5	3	3	0	0	0	3	7	26	2.4
9 p.m.		2	0	3	4	1	2	1	0	1	2	0	16	1.5

D. DIURNAL DISTRIBUTION OF THE CLADOCERA

Tables 27 and 28 and fig. 8 (*c*) set out the total count over five squares of the Cladocera for each diurnal catch over the same twelve-month period already considered for the other groups. The following extract from the author's log for January, 1938, has a definite bearing on the consideration of these results:—

'The trip was, on the whole, notable for the roughest conditions so far recorded when towing. At 3 p.m. it was too rough to tow, but the boat was launched at 4 p.m. (26th January). However, there was too much debris, and the attempt was a failure.'

The 3 p.m. gap for January in tables 27 and 28 is unfortunate, as it probably throws out the averages more than a gap in any other month could have done. The catches would certainly have been large—all January, 1938, catches were. The average for the twelve months has not been adjusted to allow for this, but as the 3 p.m. average for both surface and depth would certainly have been much higher, the graph (fig. 10) ignores these low values and gives a more likely interpretation of the numbers of Cladocera present. Taking the new readings from this graph the block for 3 p.m. in fig. 8 (*c*) has been extended by dotted lines to show the same interpretation.

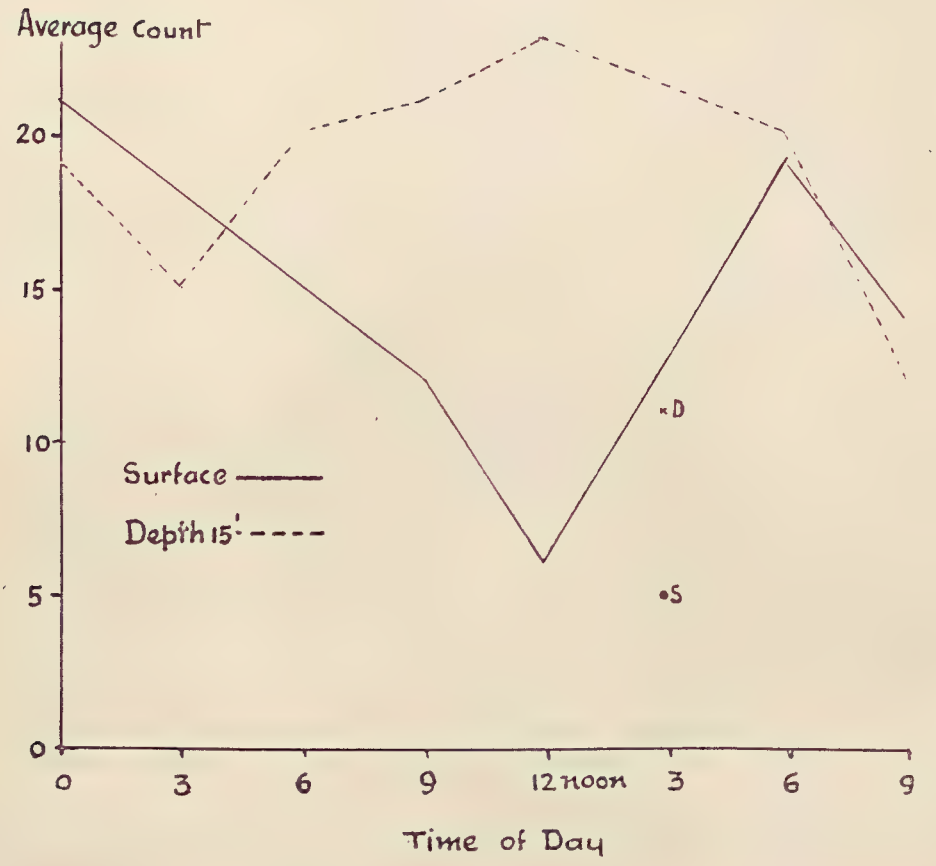


FIG. 10.—Diurnal distribution of the Cladocera. Annual average for each time of day (see Tables 27 and 28). S, D = the 3 p.m. averages have been omitted (see Section 9D).

Keeping this interpretation in mind the surface minimum is at about mid-day, whilst the maximum is recorded between 6 p.m. and midnight. The depth average minimum appears to be at 9 p.m., whilst the maxima are recorded in the daylight hours from 6 a.m. to 6 p.m. There is little difference in the congregations of Cladocera throughout the 24 hours at this depth, as, apart from the minimum already mentioned and a slightly higher minimum at 3 a.m., the range is from 19 to 23 (3 p.m. average omitted). At no time during daylight are there more at the surface than at the depth. This is true for the two seasonal groupings as well—see later.

A conclusion may be drawn that the Cladocera find their optimum conditions in the vicinity of this depth of 15 feet.

TABLE 27

Diurnal Surface Catches of Cladocera

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.	16	1	1	2	2	1	4	13	95	75	12	28	250	21
3 a.m.	8	4	3	2	4	2	9	13	74	66	12	16	213	18
6 a.m.	13	4	3	1	2	0	3	15	44	55	20	15	175	15
9 a.m.	2	2	2	1	1	2	4	17	91	23	0	2	147	12
12 noon	P	1	1	0	1	—	1	9	31	24	1	0	69	6
3 p.m.	3	1	1	0	1	1	1	3	—	37	10	1	59	5
6 p.m. ..	10	1	2	1	3	1	7	17	118	29	27	14	230	19
9 p.m.	10	4	3	1	1	1	5	8	25	69	30	8	165	14

TABLE 28

Diurnal Depth Catches of Cladocera

Time	M 1937	J	J	A	S	O	N	D	J	F	M	A 1938	Total	Av.
0 a.m.		8	—	2	3	2	2	14	41	83	23	15	193	19
3 a.m.		4	2	11	2	2	5	17	55	50	19	3	170	15
6 a.m.		4	0	3	2	1	5	21	112	21	34	13	216	20
9 a.m.		4	4	17	2	4	8	45	69	47	11	19	230	21
12 noon		5	1	7	8	—	2	52	89	21	26	18	229	23
3 p.m.		5	2	4	2	3	7	28	—	37	15	7	110	11
6 p.m.		4	1	3	3	2	4	20	121	35	17	6	216	20
9 p.m. ...		8	3	1	2	1	2	7	43	51	13	5	136	12

Seasonal Changes in Diurnal Movements

A further examination of tables 27 and 28 shows that the mean diurnal distribution over the twelve-month period may be considered in two groups as follows:—

1. June to November.
2. December to May.

Tables 29 and 30 give the analysis of the above tables in terms of these two periods. As an indication of the total numbers of Cladocera present in the upper layers, the sum of the surface and depth averages is given in the last column of each table.

TABLE 29

Totals and Averages—Diurnal Recordings of Cladocera—June to November

Surface	Total	Average (S)	Depth Total	Average (D)	Total in Upper Layers (S + D)
0 a.m.	11	2	17	3	5
3 a.m.	24	4	26	4	8
6 a.m.	13	2	15	3	5
9 a.m.	12	2	39	7	9
12 noon	4	1	23	5	6
3 p.m.	5	1	23	4	5
6 p.m.	15	3	17	3	6
9 p.m.	15	3	17	3	6

TABLE 30

Totals and Averages—Diurnal Recordings of Cladocera—December to May

Surface	Total	Average (S)	Depth Total	Average (D)	Total in Upper Layers (S + D)
0 a.m.	239	40	176	35	75
3 a.m.	189	32	144	29	61
6 a.m.	162	27	201	40	67
9 a.m.	135	23	191	38	61
12 noon	65	11	206	41	52
3 p.m.	54	11	87	22	33
6 p.m.	215	36	199	40	76
9 p.m.	150	25	119	24	49

1. *June to November*

Fluctuations during the morning hours are very pronounced, but there is little variation from noon till midnight. Apart from maxima at 3 a.m. and 9 a.m. the numbers remain practically constant at slightly more than half the maxima. Allowing for possible experimental error, the diurnal migration of the Cladocera during the winter and spring months is not very great, although there is a definite downward trend at mid-day to avoid the sunlight.

2. *December to May*

The differences are less marked during the summer and autumn months. There is a surface minimum at mid-day with maxima likely from dusk to midnight (3 p.m. figure ignored). The small variation for the total in the upper layers suggests that the Cladocera tend to remain fairly evenly distributed at all times of the day and night. Since the depth maximum is recorded in conjunction with the surface minimum, their optimum light intensity at mid-day is not above 15 feet.

E. Examination of Diurnal Changes in Each Month

So far the diurnal observations have been discussed 'en masse'. It is now necessary to examine the actual variations for each sampling day over the period during which observations were made at Lake St. Clair, in order to see how the catches differed from the averages already determined and also to find out, if possible, what conditions other than light intensity influenced the catches.

In these results the probability of error is greater than in any of the preceding sections, because each reading is for one catch only, since a complete series of catches could be made on one day only in each month. The advantage of averaging, possible in all the early sections, is therefore lost. Gardiner (1934) mentions that netting fluctuations of $\pm$ 40 per cent are likely due to irregularity in horizontal distribution. From the general correspondence in results which, for example, made possible the seasonal groupings of diurnal readings, I am of the opinion that the fluctuations in this work were less than that figure. However, where any inexplicable divergence from what appears to be the normal diurnal variation occurs, the probability of error referred to above may be responsible.

The catches are recorded in tables 21, 22, 25, 26, 27, and 28.

May, 1937

The day for towing was preceded by eleven days of fine, clear, frosty weather.

a. Calanoida.—Small numbers of Boeckella were at the surface from 9 a.m. to noon. The maximum surface reading at 3 p.m., when the lake was choppy, was practically duplicated at 6 p.m. when it was calm and moonlight. Boeckella gradually descended until midnight, when the moon was setting, the air temperature then being 31°F. By 3 a.m., when the lake was choppy, a second maximum had been recorded, but at 6 a.m. (daybreak), with the sky clear and the lake calm, the animals were descending again.

From the general observations already made (9B) the surface maximum would be expected at dusk (6 p.m.). We find it almost duplicated at both 3 p.m. and 3 a.m. under choppy conditions.

Conclusions—

1. Vertical mixing probably occurs during disturbed conditions, since maxima were recorded when the lake was choppy.
2. Boeckella avoided the sunlight until 3 p.m. in the afternoon, by which time an adjustment to the light had taken place, perhaps combined with the effects mentioned in conclusion 1.
3. A similar, but less marked, reaction to moonlight occurred, the 3 a.m. maximum having been recorded after the moon had set.
4. There seems no reason to suppose that temperature affected the migration, as the 3 a.m. maximum was accompanied by freezing air conditions and the smaller catch at 6 a.m. accompanied milder air temperatures, the frost having thawed under the influence of a north-westerly wind.

b. Cyclopoida.—The Cyclopoida showed a decided maximum at 6 p.m. with the largest catch taken throughout the twelve months, and a definite minimum at 12 noon. For the remainder of the day the numbers were uniformly low.

Conclusions—

1. Calm conditions at the surface favoured the Cyclopoida.
2. Cyclopoida avoided the light by descending from the surface especially at noon.

c. CLADOCERA.—The Cladocera showed a minimum throughout the daylight hours, especially at noon, but increased at the surface to midnight, with a slight decrease at 3 a.m. This coincided with choppy water.

Conclusions—

1. Cladocera tended to descend when the water first became choppy.
2. Sunlight was avoided.
3. The Cladocera did not avoid moonlight since the surface numbers increased during the night.
4. Since the surface maximum was recorded when the air temperature was 31°F., the Cladocera were not very sensitive to cold surface conditions.

June, 1937

For a fortnight the lake had been perfectly calm, with clear, sunny days and extremely cold, frosty nights. As only one net of the right mesh was available on this occasion the surface and depth samples were taken on different days, so they will be discussed separately. However, the general conditions were remarkably uniform for each set of towings.

Depth Catches

The lake was calm throughout. At 9 a.m. the weather was foggy, with the air temperature at 30°F. The remainder of the day was fine and clear, with moonlight from 6 p.m. until 3 a.m. The air temperature dropped steadily from 33·6°F. at 6 p.m. to 21·8°F. at 6 a.m.

a. CALANOIDA.—Boeckella was at a maximum at 6 p.m. with moderately high numbers before and after, but a fairly steady, lower number was maintained from midnight to mid-day. This commends itself to us as possibly a typical depth variation under steady, perfect weather conditions.

b. CYCLOPOIDA.—Cyclopoida were in such small numbers that no conclusion can be drawn, except that, since most of the minima were recorded in daylight, they then prefer deeper water.

c. CLADOCERA.—Small numbers of Cladocera were recorded throughout, with maxima between 9 p.m. and midnight.

Surface Catches

The lake was calm, except between 12 noon and 3 p.m., when it was comparatively choppy. At 3 a.m. it was moonlight, with 33⅓ per cent cloud. The temperature dropped from 24°F. at 3 a.m. to 20·5°F. at 6 a.m. The daylight hours were fine and clear. At 9 p.m. the moon was rising and the temperature was 26·3°. At midnight it was moonlight, but foggy, with the temperature 21·3°F.

a. CALANOIDA.—Boeckella was at a maximum from 6 p.m. to midnight and uniformly low from 3 a.m. to 3 p.m.

Conclusions—

1. Boeckella avoided the winter sunlight, coming to the surface in numbers only after sunset.
2. The moonlight had a similar effect at 9 p.m. and 3 a.m. When the maximum was recorded at midnight the moon's rays were almost obscured by fog.

b. CYCLOPOIDA.—Numbers insufficient for conclusions to be drawn.

c. CLADOCERA.—Small numbers were recorded, with maxima between 9 p.m. and 6 a.m., all during moonlight, and very small numbers during the day. The drop at midnight was accompanied by fog.

Conclusions—

1. Cladocera avoid sunlight.
2. Moonlight seemed to attract Cladocera. (However, this may be due to movement towards uniform distribution.) The numbers fell again at midnight when the moon was obscured by fog.

July, 1937

For a week past the weather had been squally and rainy. The lake was just becoming smoother on arrival. Temperatures were higher, snowy conditions replacing the still frosty weather of the previous month. Temperatures ranged from 30°F. at 3 a.m. to 39°F. at 9 a.m.. The lake was choppy for the mid-day and midnight tows. Snow fell at 1.30 p.m., 4 p.m., and during the 6 p.m., 9 p.m., and midnight tows. The depth net at midnight scraped the bottom, so the catch was valueless for quantitative work.

a. CALANOIDA.—The surface maximum was recorded at 6 p.m., when there were ripples only on the lake and the moon was just rising. There were snow squalls. Approximately equal high catches resulted at 6 a.m., with 99 per cent cloud, and 9 p.m. when snow squalls interfered with the moonlight. The daylight surface catches were all low, the 9 a.m. minimum being recorded in sunlight from a clear sky. At noon most of the Calanoids were at a depth, whilst during darkness distribution was more even. The depth catches were fairly uniform with a maximum at 9 p.m.

Conclusions—

1. External weather conditions, such as west wind, rain, sleet and snow, did not affect the normal migrational trends already recorded.
2. The contrast between 99 per cent cloud at 6 a.m. and the clear sky at 9 a.m. caused a big drop in the numbers at the surface at the latter time, i.e., the large increase in light intensity caused Boeckella to migrate downwards.
3. There was little evidence of an afternoon adjustment to light conditions.
4. Avoidance of moonlight is suggested in that the 3 a.m. catch (moonlight) is smaller than the 6 a.m. (99 per cent cloud).

b. CYCLOPOIDA.—Once again these were present in extremely small numbers, but the daylight catches were smaller than those immediately preceding and following them.

c. CLADOCERA.—Only small numbers were recorded with surface maxima from 9 p.m. to 6 a.m., all during moonlight. A drop at midnight was accompanied by choppy conditions. They avoided the sunlight.

August, 1937 (see fig. 2)

a. CALANOIDA.—Less were recorded in clear moonlight than when fog obscured the moon just at sunrise. The minimum was recorded in fine sunny conditions at noon, but overcast conditions favoured an increase from 3 p.m. to the maximum at 6 p.m. Surface catches were comparable with the depth catches from 6 p.m. to 6 a.m.

Conclusion.—The tendency for even distribution after the surface maximum at dusk seems to have been established.

b. CYCLOPOIDA.—During daylight these were at a depth greater than 15 feet, since equally small surface and depth catches were recorded. During 6 p.m. to 6 a.m., however, more were caught at the surface than at the depth, with maximum at 6 p.m., probably due to the calm conditions prevailing. Otherwise the normal tendency seems to hold, viz.:—

Darkness—even distribution.

Daylight—minimum at surface.

6 p.m.—surface maximum.

c. CLADOCERA.—Few were at the surface at any time, with a mid-day minimum. The surface maxima were recorded in moonlight.

September, 1937

The following note was made at the time:—'The outstanding catch was the 6 p.m. surface, the first calm trip, suggesting that the plankton descended to the lower levels during rough weather, but returned to the surface layers when the lake became smooth'.

a. CALANOIDA.—The catches from 3 a.m. to noon were all small, despite the cloudy conditions.

The lake was a little rougher than in previous months and had been for a week or so. This gives more data on the choppy conditions referred to in May, 1937.

Conclusion.—The process of mixing due to choppy water brought more to the surface at the same time as the usual 6 p.m. maximum—thus causing the very large maximum.

b. CYCLOPOIDA.—Similar results obtained here with small catches till 6 p.m.

Conclusions.—Slightly choppy conditions at first did not affect the migration of the Cyclopoida, but as these conditions were prolonged the Cyclopoida descended to steadier water. On the return of calmer conditions a movement to the surface occurred, this time coinciding with the normal upward movement at dusk, giving a larger maximum. From then onwards, conditions remaining calm, the normal course was resumed. In this case they moved towards nocturnal even distribution.

c. CLADOCERA.—These followed a normal sequence for both surface and depth catches, with no special evidence to suggest that rough conditions had affected the results.

October, 1937

The 12 noon gap here was caused by a northerly wind which made the lake too rough to launch the boat. Prior to this the lake had been fairly calm (choppy at 9 a.m.), but the remaining trips were all rough. This should be a good indication of the effect of rough water on the plankton, with little sunshine to influence movement during daylight.

a. CALANOIDA.—At midnight, with moonlight and a slight ripple, a small number was caught at both surface and depth. At 3 a.m., with 99 per cent cloud, the maximum catches were recorded with several times the midnight numbers at both surface and depth. The minimum catch was at daybreak, when the lake was still calm. A big increase occurred at 9 a.m., when the northerly had been blowing for nearly three hours. The sky was still overcast. The numbers remained large for the 9 a.m., 3 p.m., and 6 p.m. trips, in each case the depth catches being rather greater than the surface ones, as they were throughout the 24-hour period. By 9 p.m., with heavy rain, the numbers were smaller; the lake was still rough.

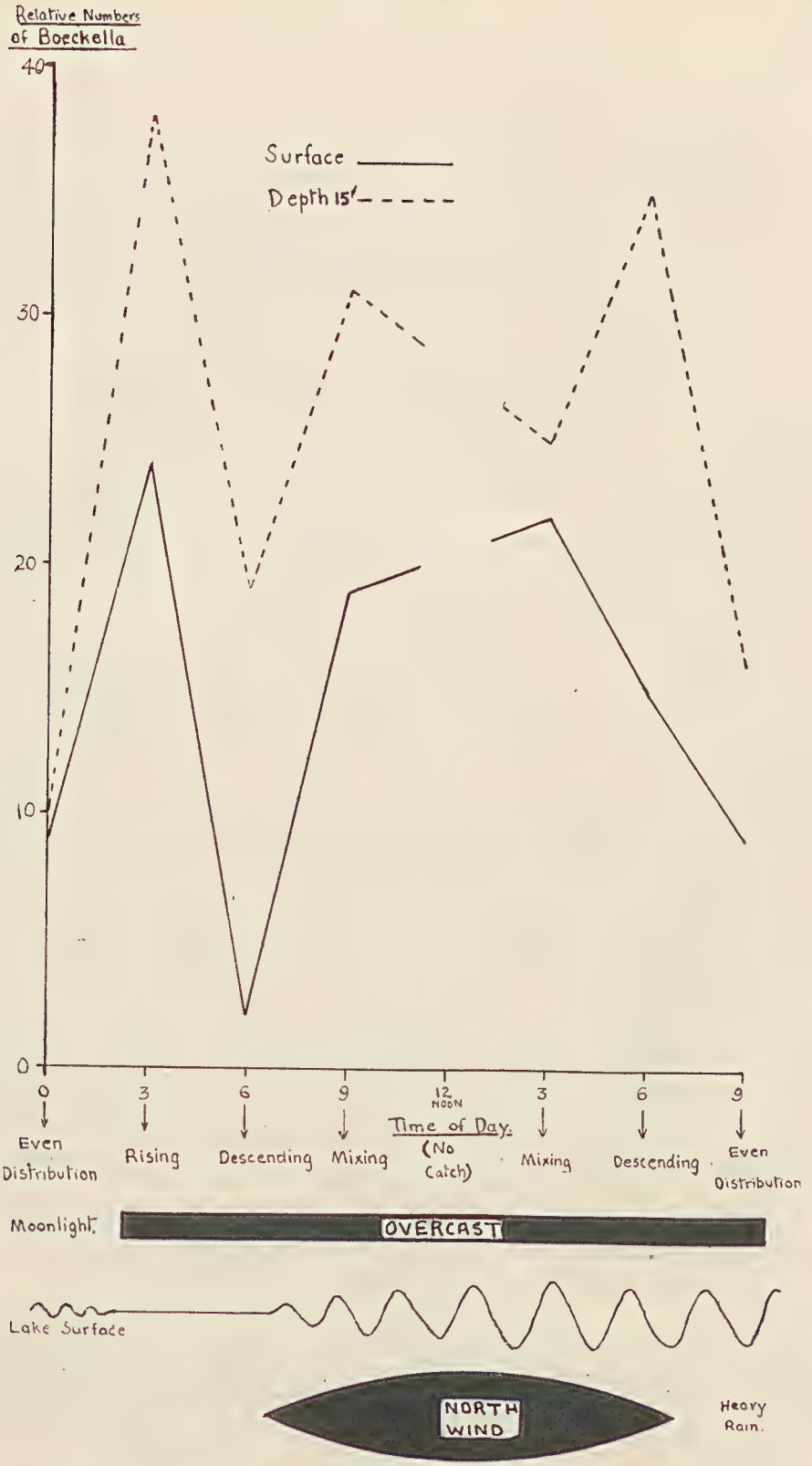


FIG. 11.—Showing response of *Boeckella longisetosa* to rough water with overcast sky, 23rd Oct., 1937 (see Section 9E). Weather conditions for each tow are indicated directly under each time of day.

Conclusions (see fig. 11)—

1. Boeckella retreated from moonlight, and more particularly from daylight.
2. Continued rough weather caused vertical mixing, and this, combined with a high cloud percentage, caused large daylight catches. (The noon catch was missed, but it seems from the graph that the catches would have been similar to those at 9 a.m. and 3 p.m., due to the influence of the northerly wind and overcast sky. Mixing had evidently been caused.)
3. Heavy rain did not affect the catch at 9 p.m., when the usual drop after the 6 p.m. catch was recorded.

b. CYCLOPOIDA.—Once again the numbers were small and *constant* at the surface. At a depth, numbers increased slightly at midnight, 3 a.m., and 6 p.m., i.e., during darkness.

Conclusion—The Cyclopoida prefer deeper water during daylight and disturbed conditions.

c. CLADOCERA.—The numbers were slightly greater than for the Cyclopoida, but with little change throughout the 24 hours. There were a few more in the depth catches. The minimum was at 6 a.m. (daybreak).

November, 1937

The weather during the preceding week had been rough and unsettled, with a heavy snowfall five days before towing was done. For towing, the weather was fine throughout and the lake at no time rough, the 6 p.m. (sunset) trip being just slightly choppy. The moon during the night was obscured by 98 to 100 per cent cloud, which diminished to 20 per cent by 9 a.m. The day was sunny. This trip furnished normal collecting results.

a. CALANOIDA.—Surface catches were fairly constant at a high figure from midnight to 6 a.m., decreasing at 9 a.m., with a big drop to noon. Minimum at 3 p.m., maximum at 6 p.m., with small drop to 9 p.m.

The depth catches were lower during the night, but considerably higher during daylight, the depth maximum coinciding with the surface minimum. The variations followed the annual average, except that the surface maximum was less than the depth maximum.

Conclusions—

1. Boeckella descended during daylight, congregating at about 15 feet and tended to distribute evenly during darkness.
2. Cloud obscuring the sunrise (5 a.m.) allowed Boeckella more time at the surface.

b. CYCLOPOIDA.—Surface catches were fairly constant, with minimum at noon and maximum at 9 p.m.

Conclusions.—As for Calanoida.

c. CLADOCERA.—Maximum surface catch was recorded at 3 a.m., the minimum at noon and high again at 9 p.m. This was a normal sequence.

Conclusions.—Similar to other two groups.

December, 1937

Rain had been falling prior to the first tow at midnight, when a west wind made the lake very rough and blew the boat well out of its course. Conditions improved thereafter, and it was almost calm at 6 a.m., although choppier for the 9 a.m. and noon tows. This is the first month of the larger catches of Cladocera.

a. CALANOIDA.—The catches were in normal sequence, except for a maximum with 65 per cent of cloud at 9 a.m. (the 6 p.m. also was large) and a minimum at 9 p.m. The maximum may be accounted for by the mixing during rough conditions as noted previously. The downward movement caused by stronger sunlight set in soon afterwards, giving much lower readings at noon, with 55 per cent cloud, and 3 p.m., with 45 per cent cloud. The substantial 6 p.m. increase usually noted took place with 100 per cent cloud. The usual 9 p.m. drop, noticeable for both surface and depth, took place under calmer conditions with 75 per cent cloud and no moon.

Conclusions—

1. Boeckella was found in larger numbers at the surface due to mixing following continued rough weather.
2. There is a direct correlation between surface numbers and cloud percentage under normal weather conditions (see fig. 12).

b. CYCLOPOIDA.—Very few at the surface, and then only at night. None at 3 a.m. (daybreak), nor until 6 p.m. (100 per cent cloud). A few more at 15 feet.

Conclusion.—Cyclops avoided the surface, especially during sunlight.

c. CLADOCERA.—These followed a normal sequence, but with maxima at 9 a.m. and 6 p.m. The 9 p.m. catch was low, both surface and depth.

Conclusions—

1. Rough water had less effect on the Cladocera.
2. As for Calanoida.

January, 1938

This has already been mentioned as notable for rough weather, due to northerly winds, with loss of the 3 p.m. catches. The only reasonably smooth trips were at 6 a.m., noon, and 9 p.m. The midnight and 3 a.m. tows were accompanied by displays of the Aurora australis in a clear sky.

a. CALANOIDA.—Minima were recorded at midnight and 3 a.m. These coincided with a heavy swell and rather rough conditions respectively, and the Aurora. Since they were very low, one wonders whether the Aurora could possibly have had some effect, since the southern sky was brightly lit with vertical bands of light. The remaining tows were all much larger, except the 6 a.m. and 9 a.m. depth catches, but there was no definite sequence indicated. The 12 noon catch was larger than is usual at this time, but two definite factors contribute to this:—1. Although the lake was smoother, mixing due to rough conditions had occurred; and 2. There was 100 per cent cloud, so that the normal movement away from sunlight was reduced.

The catches from 12 noon onwards suggest vertical mixing during rough conditions, as in October, 1937. In both these months vertical mixing followed the blowing of a north wind for three hours.

b. CYCLOPOIDA.—None was found in surface catches, and at midnight only in the depth catches.

Conclusion.—Cyclopoida favoured the deeper water.

c. CLADOCERA.—A normal sequence of catches, with minimum at noon and maximum at 6 p.m. There is little indication of rough weather affecting the migration here.

FIG. 12.—Correlation between surface catches of *B. longisetosa* and percentage of cloud, 21st Dec., 1937 (see Section 9E). Wind strength (approximate) and wave height (approximate) are indicated under each time of day.

February, 1938

Although the work was carried out under wintry conditions, the surface of the lake was only slightly disturbed, but the rain was cold and constant; the surrounding mountains were snow-covered; the last tow, 9 p.m., was carried out in driving sleet, and by next morning the shores of the lake were snow-covered.

a. CALANOIDA.—All catches were small and not comparable with any previous trip. A high reading at noon was caused, no doubt, by the heavily overcast conditions. Depth catches suggested that from midnight to 9 a.m. these Crustaceans had descended to deeper water, whilst from noon onwards they seemed to be taking up an even distribution. The erratic nature of the movements is possibly explained by the fact that a summer brood was finding difficulty in adjusting itself to wintry conditions.

b. CYCLOPOIDA.—Few were present, none being recorded at the surface or 15 feet from noon to 6 p.m., but they were fairly evenly distributed for the remainder of the day.

c. CLADOCERA.—These at the surface followed normal sequence, with numbers gradually decreasing as daylight increased, and increasing again at night.

March, 1938

The lake was the calmest for some months, with a slight ripple at noon and 3 p.m. only. The cloud decreased from midnight to 9 a.m. (50 per cent cloud). But then the cloud increased and till 6 p.m. was 100 per cent. By 9 p.m. it had diminished to 70 per cent. Light, steady rain fell during the 6 p.m. trip and a heavy rain squall preceded the 9 p.m. trip.

a. CALANOIDA.—Like December, 1937, a large 9 a.m. maximum is recorded, but this time following a 6 a.m. minimum. On this occasion, mixing after storm can have nothing to do with the maximum, as it was the fourth of a series of calm trips. Also the amount of cloud was 25 per cent less than the 6 a.m. minimum. Apart from these two trips the normal sequence was maintained. A remarkable feature of the Calanoid maximum is that no Cyclopoida or Cladocera were counted in this tow. The large catch may have been caused by the chance presence of a swarm in the towing course.

b. CYCLOPOIDA.—Once again present in small numbers, but more than since November, 1937, so that some attempt at analysis of diurnal movement can be made. Few were at the surface at midnight, none at 6 a.m., 9 a.m., or 9 p.m; more at noon and 3 p.m., with a maximum at 6 p.m. The depth catches were more uniform with minimum at 6 a.m., having maxima before (3 a.m.) and after (9 a.m.).

Conclusion.—The earlier surface minimum was due to the overcast sky at noon, permitting more Cyclopoida to reach the surface at that time.

c. CLADOCERA.—These followed a normal sequence with minimum at 9 a.m. (nil), increasing, slowly at first, to 6 p.m., with a maximum at 9 p.m.

April, 1938

The lake was the lowest level since towing was commenced twelve months ago. The day for towing was beautifully fine, although the nights were cold. The cloud decreased from midnight (100 per cent) to noon (nil), and remained so until 9 p.m., when mist was rising from the lake with the air temperature at 38°F. The day was one of normal weather conditions and should give 'type' variations.

a. CALANOIDA.—Normal catches were taken with minima around 12 noon and maxima at 9 p.m., closely following the normal variations.

b. CYCLOPOIDA.—Normal catches were taken, with minima from 3 a.m. to at least 9 a.m. and a maximum at 6 p.m.

c. CLADOCERA.—High numbers were caught from midnight (maximum) to 6 a.m., with a minimum (nil) at noon, followed by a big increase to 6 p.m. This is a more or less normal distribution.

A full series of observations having been taken for the previous twelve months, less tows were done from May, 1938, to May, 1939. Brief comments on these are given hereunder:—

May, 1938

The towing was preceded by fine, settled weather, the night being mild, temperature 50°F. at midnight. The noon and 6 p.m. trips were carried out in rain showers.

a. CALANOIDA.—Minimum at noon, maximum at 6 p.m. with 100 per cent cloud on both occasions, but the cloud was less before noon. This is a normal variation, unaffected by rain.

b. CYCLOPOIDA.—Although only small numbers were present, the minimum at noon and maximum 6 p.m. suggest a normal distribution.

c. CLADOCERA.—Showed a minimum at noon, with a maximum at 6 a.m. (The frequency with which a late evening or early morning maximum is recorded is worthy of investigation. Evidently the Cladocera are negatively geotropic and in the absence of sunlight may move towards the surface.)

July, 1938

Following a fortnight of snowy conditions on the lake shore, the tows were carried out in calm water.

a. CALANOIDA.—Normal distribution.

b. CYCLOPOIDA.—Recorded at midnight only.

c. CLADOCERA.—There was a maximum at midnight, when it was moonlight, and at 7 a.m., with 100 per cent cloud. There was a minimum at 12 noon.

August, 1938

Snow was on the ground during the tows. The lake was slightly ruffled only, with little cloud after the 6 p.m. tow, which was the first of the series.

a. CALANOIDA.—The maximum was at 6 p.m., the minimum being recorded at 6 a.m. (sunrise, with only 2 per cent cloud). The numbers were still low at noon, when 40 per cent cloud partly obscured the sun. A correlation between catch and cloud percentage was again obtained.

b. CYCLOPOIDA.—With a maximum at 6 p.m. and a minimum at noon, these were normal.

c. CLADOCERA.—Minimum, noon; maximum, 6 a.m. (cf. July, 1938).

October, 1938

The lake was many feet above normal, having been raised by the Hydro-Electric Commission's dam at Derwent Basin. A northerly gale prevented towing until the 18th, when the lake was smoother.

a. CALANOIDA.—A maximum was recorded at 2 p.m., when the lake had become calmer. The rough conditions brought on by the northerly had caused mixing.

b. CYCLOPOIDA.—Maximum at 9 p.m. with minimum at 11 a.m. Normal migration.

c. CLADOCERA.—Present in small numbers at surface. The numbers were slightly greater at depth, where there was a maximum at 9 p.m. and a minimum at 7 a.m. next day.

December, 1938

The weather was fine with little cloud, and the water calm to choppy.

a. CALANOIDA.—Minimum mid-day; maximum at dusk. The large depth maximum at mid-day stresses the avoidance of sunlight, and that there was no objection to it at 15 feet.

b. CYCLOPOIDA.—Normal distribution.

c. CLADOCERA.—Minimum at mid-day; maximum at dusk—high again at midnight, when it was moonlight with 30 per cent cloud.

February, 1939

Drizzly conditions throughout the tow. Depth tows only were done, chiefly for comparison with the pump catches, and are dealt with in Section 10A. The weather conditions were not nearly as wintry as in February, 1938, and the catches compared more closely with January, 1938, than with February of that year.

April, 1939

Conditions were slightly rough with a north-west wind.

a. CALANOIDA.—Normal.

b. CYCLOPOIDA.—Normal

c. CLADOCERA.—Minimum at noon, high at 5 p.m., maximum at 9 a.m. Between noon and 1 p.m. three horizontal hauls at different depths were taken. The results of these are discussed later.

May, 1939

One hundred per cent cloud over the lake.

All catches compared favourably with May, 1938, the conditions of cloud, temperature, and lake surface being similar, although the wind this time was from the east (North in 1938).

November, 1940

In the middle of 1939 the author commenced visiting the Great Lake once a month for similar work, so that the visits to Lake St. Clair had to be discontinued, except for occasional work there. Water samples for analysis were obtained by arrangement with the National Park ranger.

In November, 1940, when a visit was made, water for analysis was collected and a single tow carried out at 3 p.m. at the time water samples were collected, with the following results:—

Calanoida	Cyclopoida	Cladocera	Total
198	—	141	339

The weather was fine and clear, the lake being calm. The catch was one of the smallest recorded. The most likely explanation is the effect of sunlight from a clear sky on still water, but the pH reading was lower than in the previous years and may have had some bearing on the reduced catch.

F. HORIZONTAL HAULS SUPPLEMENTING REGULAR DIURNAL OBSERVATIONS

May, 1937

These three hauls were carried out on a cold frosty morning over the usual 15-minute tow course. Table 31 shows the total count of each catch.

TABLE 31.

Time	Depth	Cal.	Cyc.	Clad.	Total	Colour of Calanoida
7.55 a.m.	Surface	4,242	2,545	3,394	10,181	Light colour
7.15 a.m.	5 ft.	54,439	0	11,878	66,317	Dark colour
7.35 a.m.	10 ft.	42,420	848	7,636	50,904	Dark colour

These hauls were taken within a few minutes of one another (only one net being available in May, 1937). They showed—

1. The movement away from the surface in sunlight.
2. That the darker coloured Copepods avoided the surface light more than the green ones (see 6L).

April, 1939

In April, 1939 (between 12 noon and 1 p.m.), three hauls were taken at different depths (see table 32). The noon hauls were over the towing course and the 36 feet depth haul was continued on from the end of this into the deeper water. The lake conditions at the time of the hauls were slightly rough, due to a north-westerly wind, with 80 per cent cloud.

TABLE 32

Mid-day Horizontal Catches on 13th April, 1939

Time	Depth	Cal. a.	Cyc. b.	Clad. c.	Index of Total Catch	Temps. °C.	
						Air	Water
12 noon	Surface	16	1	7	4·8	11·4	13·5
12 noon	15 ft.	54	5	18	15·4		13·4
1 p.m.	36 ft.	23	1	19	8·6		13·3
Totals		93	7	44	28·8		
Mean		46·5	3·5	22	14·4		

N.B.—The results shown for the three groups in table 32 are the count over five squares of the counting slide.

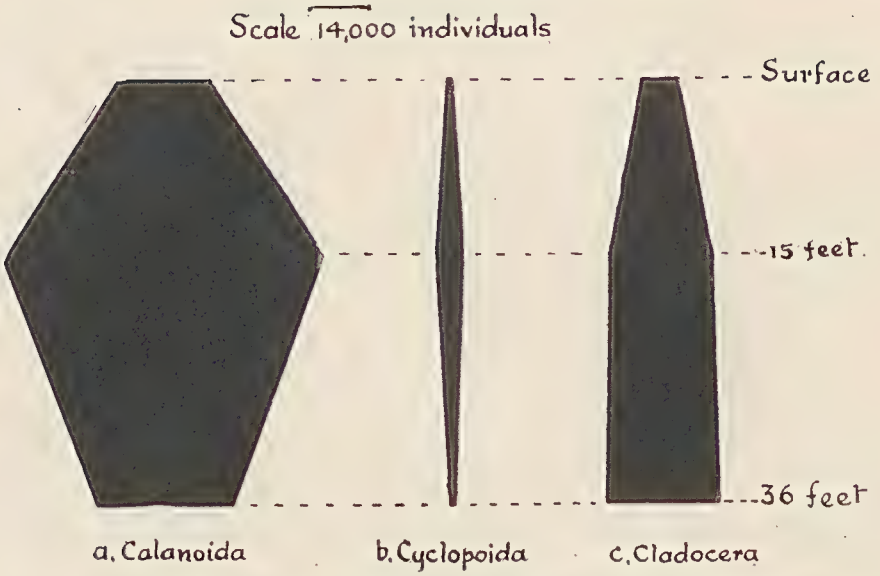


FIG. 13.—Comparison of horizontal hauls at different depths (caught between 12 noon and 1 p.m., 13th April, 1939, see Table 32). The horizontal distance is a measure of the number caught at each depth.

Figure 13 gives a picture of the probable disposition of the three groups at the time.

a. CALANOIDA.—The mean of the catches gives a result not far removed from the catch at 15 feet. This tends to confirm the conclusion already arrived at that the Calanoida have an optimum light intensity of 15 feet at mid-day in the spring and summer months.

Since these catches were made in the first half of April, practically at the junction of the two six-month periods in which the diurnal distribution of the Calanoida was considered in Section 9B, they may therefore be considered as indicative of the conditions pertaining at the end of the October-March period referred to as spring and summer months.

b. CYCLOPOIDA.—From the evidence here shown, the impression might be gained that the Cyclopoida congregate at about 15 feet at mid-day. But most of the available evidence suggests that they prefer a lower light intensity, so that a conclusion from this isolated example would be dangerous.

c. CLADOCERA.—The picture of the mid-day catches of the Cladocera (fig. 13 (*c*)) shows a distribution rather different from the other two groups, in that the numbers are much the same at 36 feet as at 15 feet. The inference is that, although the Cladocera descend to, probably, 15 feet to avoid the mid-day sunlight, they do not congregate there but distribute more or less uniformly below that depth. This accords with the suggestion in 9D 'that the Cladocera tend to remain fairly evenly distributed at all times of the day and night'.

Results of Horizontal Haul at 100 *feet* (30 *metres*)

This was carried out on 13th April, 1939, shortly after 5 p.m., giving the following *total count*:—

Calanoida	Cyclopoida	Cladocera	Total
1697	85	848	2630
65%	3%	32%	

The majority of the Cladocera present were *Ceriodaphnia* spp.—only 10 per cent were not.

During this tow the net scraped the bottom, which was soft mud, bringing up a little debris, amongst which the following were seen:—

1. A small univalve Mollusc (1·4 mms. long).
2. Seven specimens of *Phreatoicus* sp.
3. One specimen of *Chiltonia* sp.
4. One Cypris—the only one recorded in four years' work at the lake.
5. Two mites of different species.

The haul was made immediately after the 5 p.m. surface and depth (15 feet) hauls, by continuing to row out to the deeper part of the lake. All hauls were of the same duration. Although the catch was extremely small, its measurement has been expressed in the same unit as the others for purposes of comparison (table 33).

TABLE 33

Comparative Figures—Horizontal Hauls, 13th April, 1939

Time	Depth	Cal.	Cyc.	Clad.	Index of Total Catch	Temps. °C.	
						Air	Water
5 p.m.	Surface	36	3	14	10·6	11·6	13·3
	15 ft.	76	2	13	18·2		
	100 ft.	1·2	0·06	0·3	0·31		

The usual afternoon movement to the surface had set in in preparation for the dusk maximum. The numbers at 100 feet were very small indeed by comparison with the upper layers, but the significant feature of these results is that the relative numbers of the three plankton groups at the same depth are in approximately the same proportion as in the upper layers. This means that regular horizontal hauls nearer the surface gave a true interpretation of the relative numbers of each plankton group in the lake. In particular, the results confirm the smaller percentage of Cyclopoida (4 per cent of total in upper layers—3 per cent of total at 100 feet) by showing that they were not simply in the deeper layers, which would have prevented them being accurately sampled by the regular hauls.

G. CHANGES IN LIGHT INTENSITY

Johnson (1938) found that the greater the increase in light intensity the further down the Copepod, *Acartia clausi*, went. This finding is examined for Boeckella.

TABLE 34

Relation of Boeckella to Light Intensity

Month	Time	Surface Catch	Conditions	Catch Reduction Ratio	Light Intensity
1937—					
May	6 a.m.	17	Calm, clear, no moon	—	Increase in light itensity
	9 a.m.	2	Sunshine	0·118	
June	6 a.m.	3	Calm, clear, moon	No reduction recorded	No change indicated by smaller change in light intensity
	9 a.m.	3	Sunshine		
July	6 a.m.	33	99% cloud	—	Greater increase in light intensity
	9 a.m.	3	Sunshine	0·091	
August	9 a.m.	37	Fine, clear, sunny	—	Larger increase in light intensity
	noon	4	Maximum sunlight	0·108	
September ..	3 a.m.	9	Choppy, misty rain	—	Steady reduction as daylight increased to a maximum
	6 a.m.	6	Choppy	0·33	
	9 a.m.	3	Choppy	0·33	
	12 noon	1	Choppy	0·33	
October	3 a.m.	24	Calm, 99% cloud	—	Increase reduced by cloud
	6 a.m.	2	Calm, 50% cloud	0·083	
November .	6 a.m.	32	Calm 100% cloud	—	Shows preference for higher light intensity by summer brood
	9 a.m.	20	Slightly choppy, 20% cloud	0·875	
	12 noon	9	Slight ripple, 0% cloud	0·45	

The table is self-explanatory, amplifying the information given in the previous portions of Section 9, and shows how Boeckella reacts in a similar manner to *Acartia clausi* in response to sunlight.

H. Relative Numbers of Sexes (Calanoida)

Unfortunately, time did not permit a detailed analysis of the relative number of males and females in the catches. No males were observed in the Cyclopoida and Cladocera. Appended is a table showing the obversations made.

TABLE 35

Percentages of Males and Females (Boeckella longisetosa Smith*)*

Month	Time	Depth (feet)	% Males	% Females
July, 1937	noon	Surface	0	100
		15	13	87
September, 1937 ..	noon	Surface	0	100
		15	8	92
	6 p.m.	Surface	52	48
December, 1937 ...	noon	Surface	10	90
		15	11	89
March, 1938	9 a.m.	Surface	0	100
	noon	Surface	0	100
		15	0	100
	6 p.m.	Surface	0	100
Average			9	91

All the above readings, except for March, 1938, show that the males are more sensitive to sunlight than the females, and retreat from it until the approach of dusk. This is the opposite of Johnson's (1938) findings for the Copepod *Acartia clausi* (Gesbracht), but agrees with Russell's (1928) findings for *Calanus finmarchicus*. The above table enables the following tentative conclusions to be drawn:—

1. Males have a lower optimum light intensity than females; therefore they are lower during the day but move up at dusk.
2. Males may disappear at the seasonal peaks (cf. fig. 7). They may have descended into deeper water.

I. Negative Geotropism of the Cladocera

In Section 9E, dealing with May, 1938, the frequency with which a second surface maximum occurred after 6 p.m. was mentioned. Worthington and Ricardo (1937) say that Cladocerans showed negative geotropism after removal of the light stimulus. The second surface maximum occurs, practically without exception, between 9 p.m. and 3 a.m. At the same time the depth reading is usually quite high and, on occasions, exceeds that of the surface maximum (see tables 27 to 30).

Thus, whilst negative geotropism does seem to be indicated, it is not sufficiently marked to upset completely the theory of uniform distribution.

J. General Conclusions as to Diurnal Migration

a. Calanoida *(Boeckella longisetosa)*

1. The position of optimum light intensity at noon sinks from the surface, particularly in clear sunshine, in both summer and winter, being not above 15 feet depth in the summer and rather deeper in the winter.

2. An adjustment to light intensity takes place early in the afternoon, so that Boeckella is found nearer the surface. A maximum is reached late in the afternoon (dusk in the autumn, darkness in mid-winter). Then follows a tendency for even distribution.

3. A similar, but less marked, reaction to moonlight occurs. (There is also a suggestion that the Aurora australis caused a downward migration.)

4. The effect of clouds is to reduce the light intensity, causing Boeckella to rise. When conditions otherwise are normal, there is direct correlation between surface numbers and cloud percentage. This effect, therefore, influences also the degree of vertical mixing.

5. Vertical mixing occurs during disturbed conditions, usually brought about by north to north-west winds, especially if these conditions are prolonged, and the normal migration is upset. Larger numbers than usual are then found at the surface. Two factors combine to cause this:—

(i) The actual movement of the water.

(ii) The resultant increase in suspended matter—the finely-divided material tending to screen out the light.

6. Males have a lower optimum light intensity than females, and do not move to the surface in numbers until dusk.

b. Cyclopoida

1. Since the larger surface catches, *without exception,* were taken in calm conditions, these evidently favour the Cyclopoida.

2. The position of optimum light intensity recedes from the surface at noon, and is probably below 15 feet depth (i.e., Cyclopoida avoid the surface during daylight and during rough weather).

3. The normal migration is as follows:—

During daylight—downward movement.

Late afternoon—upward movement.

Darkness—uniform distribution.

4. The presence of cloud reduces the effect of sunlight.

c. Cladocera

1. The position of optimum light intensity at noon is not above 15 feet depth, and the tendency is for even distribution below this level rather than to congregate at any particular level.

2. Adjustment to light intensity early in the afternoon causes a rise to the surface, bringing a maximum in the late afternoon. Then follows a tendency for uniform distribution with slight fluctuations which sometimes cause an early morning surface maximum, showing a preference for darkness and suggesting negative geotropism.

3. Cloud reduces the reaction to sunlight.

4. Moonlight has less influence on the Cladocera than on the Calanoida, as numbers remain high during moonlight.

5. The Cladocera tend to descend when the water first becomes choppy, but vertical mixing follows. Nevertheless, of the three groups studied, the Cladocera are least affected by disturbed water.

d. Conclusions Common to All Three Groups

1. Under fine, calm, clear weather conditions all three groups (Calanoida, Cyclopoida, and Cladocera) react very similarly, especially during daylight.

2. Diurnal changes in temperature are comparatively small and have no apparent effect on the migration of the plankton.

3. Rain, sleet and snow, in season, do not affect normal migrational tendencies, but the two latter in particular, associated with colder temperatures, may cause unusual fluctuations out of season.

10. Other Observations

A. Pump Catches

The 'Ajax' pump was not obtained until February, 1939, after which is was used in the remaining trips to the lake during that year. The following table sets out the results of its use:—

Table 36

Pump Catches at a Depth of 20 Feet (1939)

Date	a	b	c	Total	Strokes	No. per gallon Approx.	No. per 10,000 Litres Approx.	Comments
25 February								
0 a.m.	12	—	48	60	200	3	6,600	Smooth swell. Light N.W. wind. Pump leaking
10 a.m.	314	—	628	942	200	45	99,100	100% cloud. Choppy swell
3 p.m.	393	—	943	1336	200	64	141,000	
12 April								
5 p.m.	2828	471	707	4006	400	96	211,500	
19 May								
6 p.m.	471	157	236	864	200	42	92,500	Much debris from bottom

In every catch the plankters were much mutilated and in only one observed specimen (a Cladoceran, 19th May) were the eggs still attached.

Gibbons and Fraser (1937), in describing their experiments with plankton collecting by pump, state that in 1897 Dr. Frenzel considered that a large volume should be filtered (minimum 500 litres). The largest volume pumped at Lake St. Clair was 190 litres (12th April) and, as even this small volume took 15 minutes, it will be seen that regular diurnal observations with this pump (especially working single-handed) would not be possible.

Gibbons and Fraser used a two-inch petrol driven centrifugal pump capable of 1800 revolutions per minute on a small research steamer. They found that a volume of 2700 litres of water took only 10 minutes.

Summing their observations they found the pump 'efficient, self-priming, and reliable'. The 'Ajax' pump used at the lake worked reasonably well (although sometimes it leaked), but was not self-priming. As it had to be transported from the police hut to the boat on each excursion to the lake, the weight of the pump was a distinct disadvantage. The length of the handle made it necessary to stand when pumping so that use in other than calm water was impossible.

The authors mentioned above do not recommend the use of a pump where the plankton frequency is less than one of the species per five litres of water. As the smallest catch recorded (25th February, 0·00 a.m.—see table) was equivalent to eight plankters per five litres, making no allowance for the fact that the pump was

leaking, and the quantity of water per stroke consequently reduced, the method was quite suitable in this respect.

TABLE 37

Comparison of Plankton Catches by Net and Pump

Date	Time		Percentages		
			a	b	c
February 25th.	10 a.m.	Net	20	—	80
		Pump	33	—	67
	3 p.m.	Net	20	—	80
		Pump	29	—	71
April 12th	5 p.m.	Net	65	6	29
		Pump	70	12	18
May 19th	6 p.m.	Net	64	7	29
		Pump	55	18	27

These percentages do not agree completely, but the general trends are the same, and absence of Cyclopoida (*b*) on some occasions is confirmed. Whereas the pump operates at one selected point only, the net collects over a distance and may well pass through areas where the plankton may be scarce or abundant, so that exact correspondence cannot be expected from the two sets of catches even if the methods are otherwise completely comparable.

B. VERTICAL HAULS

16th July, 1938; 3.30 p.m.

This was a particularly interesting haul in that it was carried out off the western shore just beyond Myrtle Point, near 'Fergie's Beach', where the lake is probably deepest. On this occasion, with the cable out at its full length of some 720 feet, the lake-bed was not reached. The test of depth having been made, a vertical haul, with the end of the net weighted, was carried out from a depth of 214 metres (702 feet) to the surface. The catch was as follows:—

Calanoida	Cyclopoida	Cladocera	Total
701	41	82	824

31st August, 1938; 12 noon

The haul was carried out at the end of the tow-course from a depth of 38 metres (125 feet) where the water temperature was 6·9°C. The catch was as follows:—

Calanoida	Cyclopoida	Cladocera	Total
4171	—	495	4666

These hauls were carried out with the same net (No. 2. See Section 5B) as the horizontal hauls.

11. Summary and Conclusions

In this summary the numbers used are the same as the sections to which they refer. The main conclusions are indicated.

1. The main object of the work was to investigate the conditions of life and behaviour of the plankton Crustacea, particularly the Copepoda.

2. This was the first ecological study of the Tasmanian fresh-water plankton. It was beyond the capacity of one individual to make a thorough ecological study.

3. Description of the equipment used.

4. Description of the geography and geology of the Lake St. Clair region, and of the area at the southern end where most of the observations were made.

5. The plankton of the lake was examined quantitatively, chiefly by horizontal hauls at the surface and at a depth of 15 feet., using silk nets having 26 meshes per centimetre. The nets were towed behind a rowing-boat for 15 minutes on each occasion, making allowance for weather conditions. A hand-pump was experimented with for plankton sampling, but, owing chiefly to difficulty in handling, was not favoured. Methods of counting the catch are discussed: if large, an individual count of a representative sample of the total catch was taken; if small, a modification of this method was used.

6—A. As there was no fully-equipped weather station at the lake, records of temperature, rain, wind, and cloud, &c., for Tarraleah (the nearest station), and the few available records for Lake St. Clair, were obtained from the Commonwealth Meteorological Bureau at Hobart.

B. The air and water temperatures obtained from the above source, and by personal observation, are tabulated. There is evidence of a summer thermocline at 15 metres.

C. Graphs comparing water-level and rainfall show a general correspondence, except where the lake level was artificially controlled by the Hydro-Electric Commission for constructional work.

D. The prevailing winds were north-westerly to westerly and these had most effect on the diurnal distribution of the plankton.

E. Cloud percentages for Tarraleah and, when available, for Lake St. Clair are given as a guide to the amount of sunlight.

F. A chemical analysis of the water is given.

G. The amount of suspended matter may vary considerably with weather conditions.

H-K. Dissolved oxygen, free carbon dioxide, combined chlorine, and the oxygen absorbed showed comparatively small variations, either at the surface or, for the first three named, at various depths.

L. The pH value ranged from 6·4 to 6·6 during 1937-39, but was a little lower in 1940. The possibility of cold, acid, lake-water causing the reddish-brown colour of some Copepoda is discussed.

7. A list of animals seen or caught is given. This includes a Copepod (of the family Cyclopidae) not previously recorded in Tasmania.

8. The survey covers the period May, 1937, to November, 1940, the most intensive collecting work being carried out in the first twelve months.

A summary of the monthly horizontal surface and depth hauls is shown. To minimise errors due to irregular vertical distribution the mean of surface and depth readings is taken as a measure of the total plankton present at any given time.

The Copepoda constitute the majority of the plankton, *Boeckella longisetosa* being the dominant species. The Cladocera (represented by four species) are about 40 per cent of the total. Reasonable correspondence is found in the numbers present in succeeding years.

The winter maximum is brought about almost entirely by the Calanoid Copepod—*Boeckella longisetosa*—which remains present in reasonably large numbers throughout the year, reaching a large maximum in the summer, due to the presence of immature specimens, with breeding specimens causing the minima.

The Cyclopoid Copepoda are present in small numbers, with cyclic variations in each year.

The numbers of Cladocera vary much more than the Copepoda, with a very large summer maximum (higher temperatures).

The seasonal distribution demonstrates that there is ample food-plankton available for the brown and rainbow trout at their normal hatching season.

9. Tables of the daily catches are given and analysed for each plankton group. The various factors which may have influenced the diurnal variations are discussed. The conclusions are given in full in Section 9J.

10. The pump catches are tabulated and compared with horizontal hauls. The specimens were mutilated, but the catches were useful in that they confirmed the silk-net catches.

The results of the vertical hauls are given. One of these was carried out from a depth of 214 metres at a point where the sounding-line ran out to 220 metres (about 720 feet) which is the deepest point so far found in Lake St. Clair.

12. Acknowledgments

From 1938 to 1940 the collection of material was made possible by a yearly grant through the University of Tasmania under the Commonwealth Grant for Research in Biology.

I also wish to express my gratitude to the following institutions for financial and/or material aid:—

Tasmanian Museum and Art Gallery (Dr. J. Pearson).

Tasmanian Biological Survey (Captain D. C. Pearse).

University of Tasmania (Chemistry Department, Prof. E. E. Kurth; Biology Department, Prof. V. V. Hickman).

Tasmanian Police (Use of hut at lake).

National Park Board.

Commonwealth Meteorological Bureau, Hobart.

Hydro-Electric Commission.

Mr. A. D. Ferguson, of Lake St. Clair, and the volunteers who, by assisting me with the collection of material, made the ' 24-hour tows ' less arduous.

References

Brehm, V., 1936.—Ubr die tiergeographischen Verhailtnisse der circumantarktischen Suss-wasserfauna. *Biol. Rev. Cambridge Philosophical Soc.*, vol. XI, No. 4, p. 477

*Chandler, D. C., 1944.—Limnological Studies of Western Lake Erie (IV). Limnological and Climatic Factors and Phytoplankton of 1941. *Trans. American Micros. Soc.* 63 (3).

Clark, Ellen, 1938.—Tasmanian Parastacidae. *Papers and Proc. Roy. Soc. of Tasmania*, 1938.

Dakin, W. J. and Colefax, A., 1940.—Plankton of Aus. Coastal Waters off N.S.W. Publn. of Univ. of Sydney. *Dept. of Zool. Mono.* 1 Aug., 1940.

DAVIS, H. S., 1938.—Instructions for Stream and Lake Surveys. *U.S. Dept. of Commerce. Bureau of Fisheries. Fishery Circ. No.* 26 Washington, pp. 1-53.

ELTON, C. S., 1924.—Periodic Fluctuations in the Numbers of Animals: Their Causes and Effects. *Brit. J. Exp. Biol.* Vol. II, No. 1, Oct., 1924.

EVANS, J. W. and KERR, R., 1942.—The Food of Trout in Tasmania. *Salmon and Freshwater Fisheries Commission*, pp. 1-12.

FAIRBRIDGE, W. S., 1945.—West Australian Fresh-Water Calanoids (Copepoda). *J. of Roy. Soc. of W.A.*, Vol. XXIX, 1942-3, pp. 25-89.

FROST, W. E., 1939.—R. Liffey Survey II.—The Food Consumed by the Brown Trout in Acid and Alkaline Waters. *Proc. Roy. Irish Acad.*, Vol. 45 (B), No. 7, pp. 139-206.

GARDINER, A. C., 1934.—Variations in the Amount of Macroplankton by Day and Night. *J. Mar. Biol. Assn. of U.K.*, Vol. XIX, No. 2

GIBBONS, S. G. and FRASER, J. H., 1937.—Centrifugal Pump and Suction Hose as Method for Collecting Plankton samples. *Journal du Conseil. Permanent International pour l'exploration de la Mer.* Copenhagen. Vol. XII, No. 2.

HAIG JOHNSON, 1931.—Recent Advances in Analytical Chemistry. (Ed. by C. Ainsworth Mitchell). *Churchill*, London, Vol. II.

HENRY, M., 1922.—Monograph of F.W. Entomostraca of N.S.W. (ii). Copepoda. *Proc. Linn. Soc. N.S.W.*, 1922. Vol. XLVII, Pt 4, pp. 551-570.

HIGGINS, E., 1927.—Studies on Interior Lakes. Report by Prof. Juday, U.S. Dept. of Commerce. *Bureau of Fisheries.* Doc. No. 1044. Washington. pp. 242-245.

JENKIN, PENELOPE M., 1936.—Percy Sladen Expedition to Some Rift Valley Lakes in Kenya, 1928. Summary of Ecological results with Special Reference to the Alkaline Lakes. *Ann. and Mag. Nat. Hist. Lond.* Ser. 10, Vol. XVIII, No. 104, pp. 160.

JOHNSON, W. H., 1938.—Effect of Light on the Vertical Movements of *Acartia clausi* (Geisbrecht). *Biol. Bull.* LXXV, No. 1. United States.

JOHNSON, W. H. and RAYMOND, J. E. G., 1939.—The Reactions of the Planktonic Copepod *Centropages typicus* to Light and Gravity. *Biol. Bull.* LXXVII, No. 2. United States.

JOHNSTON, R. M., 1888.—Geology of Tasmania. *Government Printer, Hobart.*

KEMP, S., HARDY, A. C., and MACKINTOSH, N. A., 1929.—Discovery Reports. Vol. I, pp. 141-229.

LEIM, A. H., 1935.—Water Temps. in Grand Lake, Nova Scotia. *Proc. Nov. Scotian. Inst., Sc.* 18 (4), 1933-34 (1935).

LOWNDES, A. G., 1928.—Fresh Water Copepoda and Hydrogen-Ion Concentration. *Ann. and Mag. Nat. Hist. Lond.* Ser. 10, Vol. I, No. 4, p. 457.

————————, 1936-37.—Scientific Results of Expedition to the East African Lakes, 1930-31. The Smaller Crustacea. *Journ. Linn. Soc. Lond. Zoo.* Vol. XL (1936-9), pp. 1-31.

*MOOKERJEE, H. K. and GHOSH, S. N., 1944.—Culture of Daphnia. *Science and Culture.* 9 (12), pp. 558-559.

*PENNAK, J. S., 1931.—Diurnal Movement of Zooplankton in Some Colorado Mountain Lakes. *New York.* 25 (4), pp. 387-403.

PHILLIPS, J. S., 1931.—Conditions Affecting Well-being of Trout in New Zealand. *N.Z. Marine Dept. Fisheries Bull.* No. 3.

*RICKER, W. E., 1938.—Quantitative Sampling and Seasonal and Annual Variations. *J. Fish. Res. Bd.* Canada. 4 (1), pp. 19-47.

RUSSELL, F. S. and COLEMAN, J. S., 1931.—Great Barrier Reef Expedition, 1928-29. *Brit. Mus. (Nat. Hist.).* Vol. II, No. 2, pp. 5-35.

RUSSELL, F. S., 1925-34.—The Vertical Distribution of Marine Macroplankton. *J. Mar. Biol. Assn. of U.K.*

————————, 1925, I.—An Observation on Diurnal Changes. Vol. XIII, No. 4.

————————, 1926, IV.—The Apparent Importance of Light Intensity as a Controlling Factor in the Behaviour of Certain Species in the Plymouth Area. Vol. XIV, No. 2.

————————, 1928, VII.—Behaviour of *Calanus finmarchicus*. Vol. XV, No. 2.

————————, 1931, X.—Notes on the Behaviour of Sagitta in the Plymouth Area. Vol. XVII, No. 2.

————————, 1931, XI.—Further Observations on Diurnal Change. Vol. XVII, No. 3.

————————, 1934, XII.—Vertical Distribution of *Calanus finmarchicus* in Relation to Light Intensity. Vol. XIX, No. 2.

SAUNDERS, J. T., 1926.—H-Ion Concentration of Natural Waters. 1. Relation of pH to Pressure of Carbon Dioxide. *Brit. J. Exp. Biol.* Vol. IV, No. 1.

SHALLEK, WILLIAM, 1942.—Vertical Migration of the Copepoda *Acartia tonsa* under Controlled Illumination. *Biol. Bull. United States.* Vol. LXXXII, No. 1.

————————, 1943.—The Reaction of Certain Crustacea to Direct and to Diffuse Light. *Biol. Bull. United States.* Vol. LXXXIV, No. 1.

SMITH, G. W., 1909.—The Freshwater Crustacea of Tasmania. *Trans. Linn. Soc. Lond.* Ser. 2, Zool., Vol. XI, Pt. 4, pp. 61-92.

SOUTHERN, R. and GARDINER, A. C., 1926.—1. Seasonal Distribution of the Crustacea of the Plankton in Lough Derg and the River Shannon. *Fisheries, Ireland Sc. Invest.* 1926, I, pp. 1-170.

SOUTHERN, R., 1935.—Food and Growth of Brown Trout from Lough Derg and the River Shannon. *Proc. Roy. Irish Acad.* Vol. XLII (B), No. 6, p. 87.

SUTTON, F., 1924.—A Systematic Handbook of Volumetric Analysis. Lond.

TENGCO, RUSTICO, 1939.—Notes on the pH Measurement of Natural Waters. *Philippine J. of Sc.* Vol. 69, No. 1.

UENO, MASUZO, 1939.—Plankton Studies in Formosan Inland Waters. *Philippine J. of Sc.* Vol. 69, No. 1.

WARD, H. B. and WHIPPLE, G. C., 1918.—Fresh Water Biology. New York.

WELCH, P. S., 1935.—Limnology. *McGraw-Hill Co.* New York and London.

WORTHINGTON, E. B. and RICARDO, C. K., 1936.—Scientific Results of the Expedition to the East African Lakes. No. 17. The Vertical Distribution and Movements of the Plankton in Lakes Rudolph, Naivasha, Edward, and Bunyoni. *J. Linn. Soc. Lond. Zool.* Vol. XL (1936-9), pp. 33-69.

* Abstracts only of these Papers were available.

Note on Cottage Green

By

W. H. Hudspeth

(Read 13th November, 1945)

Plates IV, V, VI

INTRODUCTION

As you walk down Montpelier Retreat from Hampden-road into Salamanca-place you come, on the right, to a roadway originally called Grant-street, but now known as Knopwood-street, which leads towards the large stone house called 'Narryna' from the shabby old brick building on the corner which, in days gone by, was the Montpelier Retreat Inn and a favourite haunt of the famous Trucanini, whose pathetic skeleton adorns the Tasmanian Museum.

Turn into the street, and on the left, next to the inn, you will see the modest little dwelling known as 'Cottage Green'. It nestles in quiet seclusion in an old-world garden, of which the chief feature is an aged yew, standing, like a sentinel, just inside the gate. This unpretentious cottage, tucked away in its peaceful backwater, has for many years enjoyed a reputation and attracted attentions which must often have been a source of embarrassment to its occupants. For tradition has it that the Rev. Robert Knopwood, first clergyman of Hobart Town, once made it his home. In deference to this tradition the name 'Cottage Green' has been placed upon the garden gate and the street on which it stands has been renamed 'Knopwood-street'.

But the reputation of a house, like that of a woman, is a delicate matter: it can be tarnished, or even destroyed, by the slightest breath of criticism; like Caesar's wife, it must be above suspicion. No self-respecting ghost would care to haunt a home of which the authenticity is suspect or doubtful. And so the shade of Knopwood must have shaken in its shoes when Miss Mabel Hookey, that redoubtable champion of historic truth, boldly asserted in the 'Mercury' of January, 1945, that 'the present Cottage Green has nothing to do with Knopwood's cottage of that name'.

It is the purpose of this paper to examine the truth of that assertion and to restore peace of mind, if possible, to the unhappy ghost whose claim to possession has thus so rudely been disturbed. The old Latin adage which we learned at school, 'melius est fontem petere quam sectari rivulos'—go to the source, rather than follow its tributaries—applies with particular force to historical research, and when investigating the movements of Robert Knopwood one would naturally prefer to turn to his own diaries, which were contained in a number of volumes covering the years 1801 to 1838. But, unfortunately, several of these are missing, and those in which we might reasonably hope to find some reference material to our present inquiry are in the Mitchell Library in Sydney. (Knopwood Diary, Vol. 1801-1804; Vol. 1814-1820; Vol. 1822-1834; Vol. 1836-1838.)

Upon application to the Mitchell Library, I was informed that shortage of staff owing to war conditions made it impossible to have the diaries examined, and consequently my researches have perforce been limited to the material available in Hobart. The conclusions arrived at must, therefore, be regarded as subject to any further light which may be thrown upon the matter by some future examination of the Mitchell Library volumes.

A recent writer has observed that as these volumes are of peculiar interest to Tasmania the Government might well be asked to apply to the Mitchell Library for photostat copies, which could be placed in the State Library and be available for students of Tasmanian history.

I heartily support this proposal and would suggest that the Council of this Society would be a proper body to approach the Government on the subject.

A good deal of confusion has been caused by the use of the name ' Cottage Green ' to denote different parts of the property of Robert Knopwood. Sometimes it is applied to the whole thirty acres originally located to him; at others to the main dwelling, ' the old Parsonage ', as Ross calls it: elsewhere it refers to the three acres bought by James Grant, and at other times to other parts of the property: sometimes, as we know, it is used to denote the cottage in Knopwood-street.

For purposes of this paper, and for the sake of clearness, I propose to call the thirty acres ' Knopwood's Farm '—a name occasionally to be found in the records; the main dwelling I shall call ' Cottage Green No. 1 ' and the house in Knopwood-street ' Cottage Green No. 2 '. (Citations from the Historical Records of Australia, unless otherwise stated, are taken from Series III.)

Knopwood's Farm

1. On 1st January, 1806, a Location Order was issued by Governor Phillip Gidley King to the Rev. Robert Knopwood of thirty acres in the District of Queenborough in Hobart Town, described as follows:—

' Bounded on the North by the Burial Ground and Ground extending to the Magazine which bears from the North West corner N. 9½ East distant 13 chains. (*H.R.A.*, Vol. I, p. 568. *Ib.* Vol. V, p. 549.)

On the East for the space of 14 chains by a road 11 yards broad on the Margin of Sullivan's Cove and the remainder by unallotted Ground.

And on the West and South by unallotted land '.(1)

The area and shape of the land located are shown in a chart of 30th April, 1814, signed as approved by Governor-in-Chief Lachlan Macquarie. This chart is in the Survey Department.

---

(1) In the course of these investigations I made two curious discoveries about this Location Order:—

(1) The area comprised in it is stated in the records of the office of the Registrar-General in Sydney to be ten acres only, although the description of the land located is practically the same as that given in *H.R.A.*, Vol. I, p. 568, and Vol. V, p. 549, where the area is given as thirty acres, as in the chart of 1814 approved by Macquarie;

(2) In order to check this discrepancy I got an officer of the Survey Department here to run the planimeter over the chart and he found that the true area was approximately forty-one acres. If this is correct it would show that all the obloquy that was heaped upon Evans (apptd. 1812), who had by this time left for England, and Mr. Scott, Deputy Surveyor-General, for having marked the area as forty-one acres instead of thirty, was undeserved. This was in 1826, and the matter is now one of academic interest only, though from the correspondence in the H.R. it was considered a most reprehensible act of carelessness on the part of the officers concerned, and Knopwood himself did not escape censure.

As Mr. Masters has pointed out, the Location comprises approximately the present area of land bounded by St. David's Park and a line across to Hampden-road near the Military Hospital, then along Hampden-rd in a curved line to and across Runnymede-street, and thence across to the road on the margin of Sullivan's Cove referred to in the Location Order.

2. In his evidence before Mr. Commissioner Bigge in 1820, Knopwood says that in 1805 he had spent £1000 in building on and improving the property. (*H.R.A.* Vol. III, pp. 367-8.)

He does not specify what these improvements were, but from that portion of his diary which is in Miss Hookey's possession we learn that, in addition to the cottage, he built a ' tiled-roof pigeon house, and a barn 30 ft. long by 16 ft. wide '. (Knopwood Diary, 1805, 30 Jan., 1808, 21 Jan.)

3. In 1816 he sold the whole property to Capt. Townsend Jones for £2000. Part of the purchase money was paid in cash and the balance was to be paid within twelve months.

Capt. Jones, however, died before the balance was paid, and his widow was unable to complete the purchase. Knopwood brought a suit against her for specific performance, but failed, and as a result he was left financially embarrassed.

4. In 1824, under pressure from his creditors, Knopwood was forced to sell a portion of the property, comprising a number of allotments on the south-east side of the present roadway known as Montpelier Retreat.

Cottage Green No. 1

1. Unfortunately, the sale of the lots mentioned did not entirely relieve Knopwood from his liabilities. (*Hobart Town Courier*, 29 July, 1836.)

Edward Lord held a judgment over the residue of the property, and under that judgment such residue was sold to Henry Jennings of Launceston, in June, 1829, for £835 12s. 10d.

This residue comprised about twelve acres, on which stood Cottage Green No. 1 and two small buildings just behind it. The description of the land in the conveyance to Jennings is as follows:—

' All those twelve acres of land with the Messuage buildings and erections thereon standing commonly called by the names of " Knopwood's Farm " and " Cottage Green " in the occupation of the said Robert Knopwood being part of 30 acres originally granted to him Bounded On the North by the Burying Ground and unenclosed land On the East by the Roadway On the South by other land part of the said 30 acres now belonging to James Meers Hammond and James Grant.

On the West by the land of George Frederick Read and the Barrack Fence.

And also All other the land and hereditaments of the said Robert Knopwood known by the name of " Knopwood's Farm " not heretofore otherwise disposed of by him.'

2. Henry Jennings did not hold the property for long. In the course of a lengthy article in *The Hobart Town Courier* of 29th July, 1836, Lt.-Governor Arthur says that Jennings had expressed a desire to sell, and that he, Arthur, had authorised Alfred Stephen (the Solicitor-General) to purchase the property for him at £800.

The purchase was completed in August, 1829, and a conveyance to Arthur himself duly executed and registered. (Con. 6 & 7, Aug., 1829, 1/245.)

Arthur, in the abovementioned article, says that he had told Knopwood that he would allow him to continue in possession for eighteen months after the sale *rent free.*

3. There is no evidence that Knopwood availed himself of this offer, but there *is* evidence that in 1831 he was no longer in possession, for Dr. Ross in his Almanac for that year (1831, p. 64) says that Mr. R. O'Connor, Inspector of Roads, was then occupying Cottage Green No. 1.

4. We may pause here for a few moments to describe the Cottage and its situation.

There are three charts in the Survey Department on which the site of the cottage is shown.

The first (undated, but said to be the earliest and probably about 1820) clearly shows the cottage as situate about 120 feet back from Salamanca-place, and about half-way between what is now Gladstone-street and Montpelier Retreat (neither of which, of course, were then laid out). (See Plate IV.)

Behind the cottage itself are shown two small buildings, and also a fourth building some distance to the south-east, but further back in a westerly direction. (I shall refer to this fourth building later in more detail.)

The two other charts, one of which is dated 1828, and the other, undated, but said to be later, show the cottage and the two small buildings behind it, but not the fourth building.

Another plan, dated 1832, showing the lay-out of the whole waterfront as proposed by George Frankland, Assistant-Surveyor, clearly marks the position of Cottage Green No. 1, with its garden.

Both these later charts, and the plan, show the strip of land along the frontages of the lots on Salamanca-place which was to be excavated and levelled by the Government, by agreement with the proprietors, who had, in 1825, consented to give 87 feet for this purpose. This excavation—about 100 feet in depth—would bring the cottage almost to the edge of the cliff-face thus created. (*Hobart Town Courier*, 29 July, 1836.)

Dr. Ross, in the course of a lengthy article in his Almanac for 1836, p. 73, entitled 'The Settler in Van Diemen's Land 14 Years Ago' (i.e., in 1822), says this:—

'Mulgrave Battery . . . . slept harmless in the Margin . . . . and the small apartment where all the gunpowder of the Colony was then stored appeared at twice the distance . . .'

He then goes on: 'For though Cottage Green, the Rev. Knopwood's old Parsonage, was then in being, there was no cart or carriage road, no Wharf, nor Stores, nor Ships, and instead of going by land the traveller, or the gunpowder depositor, took boat and went by water, as being by far the easiest and most expeditious method of arriving at the spot'.

May we infer, from the Doctor's use of the past tense in the words 'though Cottage Green . . . . was then in being', that it had disappeared when he wrote this article?

In the Hobart Town Magazine of 1834, Vol. 3 appears a sketch of Cottage Green No. 1, and of the residence of John Montagu (now Stowell Hospital). The sketch is taken from a point near the site of Parliament House, and clearly shows the situation of the cottage. (See Plate V, fig. 1.)

If you walk up Gladstone-street and look over to the south-east near Johnson and Wells' foundry you can see, to-day, the face of the cliff behind the stores and other buildings, looking much the same as it does in the sketch.

In the sketch can be seen the three buildings in the centre, and to the south-east, almost hidden by shrubs, the fourth building already mentioned. Note also the two old buildings at the bottom of Montpelier Retreat. These are still standing, just above the Lord Nelson Hotel.

If you compare this sketch with the next photo, which was taken the other day from about the same spot, you will see that the Sailors' Rest and R. Nettlefold's building stand just about in front of the site of the cottage.

I have another photo looking down Montpelier Retreat which shows the two old buildings at the lower end, which appear in the sketch, as they are to-day. (See Plate V, fig. 2.)

But to come back to our examination of the title to Cottage Green No. 1.

5. In 1831 a road thirty-three feet wide was laid out from the New Wharf to Hampden-road, following the winding course of the little stream which flowed down to the Cove. (Leg. Council Minute, 12 Sept., 1831.)

This road was named 'Montpelier Retreat'.

6. Towards the end of the twenties Alfred Stephen, as Solicitor-General, had raised the question of the validity of grants and location orders issued in their own names by Governors Brisbane, Macquarie, and Darling, and had given his opinion that they were ultra vires, and that titles based upon them could be successfully attacked unless they were ratified by the issue of grants from the Crown.

Accordingly, in 1836, Arthur applied for a grant of portion of the twelve acres which he had purchased from Jennings in 1829. For some reason the grant was issued, not to Arthur, but to his Private Secretary, William Thomas Parramore. (Reg., 28 Oct., 1837.)

Arthur's detractors alleged that this was done to cover up the fact of his purchase, especially as the same course was adopted with another part of the twelve acres, for which he made a similar application. But it is, at least, arguable that Robert Pitcairn, who was his legal adviser and an able lawyer, or perhaps Alfred Stephen, had suggested to Arthur that as he would have to sign the Letters Patent himself they should not issue in his own name. Moreover, Arthur had already taken a conveyance quite openly to himself, and there would seem to be no object in, later, using someone else's name as dummy.

Whatever the reason, the grant was duly issued to Parramore, signed by Arthur and countersigned by John Montagu, Colonial Secretary. The land included in this grant is described as follows:—

'Bounded on the North West by the Burial Ground extending from Harrington Street to Salamanca Place.

On the North East by Salamanca Place.

On the South East by Montpelier Retreat.

And on the South West by Harrington Street'.

The area comprised in this grant was 4a. 2r. 26p.

7. In November, 1836, Parramore conveyed the land back to Arthur, the conveyance stating that he had no beneficial interest in the land, but held it merely as a trustee for Arthur. (Con. 2/2043.)

It may be noted that if Arthur had intended to cover up his tracks he would hardly have taken this conveyance, which would necessitate his name appearing in any subsequent dispositions of the property.

8. Not long after this conveyance another street, called 'George Street', was laid out through this block, from Salamanca-place to Harrington-street. This street is now called 'Gladstone-street'.

9. Between the years 1840 and 1848 Arthur sold various allotments of the land included in his grant. It is not necessary to refer to them all, but four are material to this inquiry:—

1. Sold in 1840 to F. A. Dowling. This fronted on Salamanca-place and is the site of The Sailors' Rest. (Con. 2/5201.)
2. Sold in 1848 to William Clues, whose name is still to be seen carved in stone on the building, which is now occupied by R. Nettlefold & Co. Pty. Ltd. (Con. 3/3985.)
3. Sold in 1843 to John Johnson. This fronted on George-street, at a distance of 105 feet from the angle of Salamanca-place, and extended south-easterly to a depth of 140 feet to a roadway 15 feet wide leading to Harrington-street. (Con. 2/6364.)
4. Sold in 1846 to Alex Orr. This fronted on Montpelier Retreat, at a distance of 166 links from the angle of Salamanca-place, and extended north-westerly to a depth of 2 chains 11¾ links to the said roadway 15 feet wide. (Con. 3/2108.)

It is almost certain that Cottage Green No. 1 and the two small buildings behind it stood on one, or perhaps both, of these two lastmentioned allotments.

Next time you are down that way walk up Gladstone-street, and, if the gate is open, you can get on to the vacant block behind Johnson & Wells' foundry, as I did the other day, and find yourself standing on the very spot from which Knopwood used to look down from his garden at the whales disporting themselves in the river below.

And this is as far as we can get with the story of Cottage Green No. 1 from the records available in Tasmania. When it was pulled down, and by whom, I have not been able to discover. It was still there in 1834, and no doubt poor Knopwood, in exile on the other side of the river, often looked across with a feeling of nostalgia. In 1826 he had written to Dumaresq, apropos of the error in the measurement of his land, 'I had suffered so much previously about my Grants that I hope for quiet for the rest of my days. My age and infirmities preclude the possibility of my future suffering from being long, and I look to the grave as a resting place for all my afflictions'.

He died in 1838, and perhaps was spared the final grief of seeing his old home demolished, at any rate we like to think so.(1)

Cottage Green No. 2

We now come to the main purpose of this paper—the investigation of the case for Cottage Green No. 2, the story of which can be traced with comparative certainty from 1824 to the present day.

1. You will remember that in 1824 a number of allotments of the thirty acres located to Knopwood, lying to the south-east of Montpelier Retreat, were offered for sale under pressure from his creditors. The date of the sale was 6th May, 1824.

One of these allotments was purchased by James Grant of Tullochgorum. It comprised three acres, with a frontage of 120 links on Salamanca-place, and extended up to Hampden-road. (*Hobart Town Gazette*, 30 April, 1824.)

After searches, both here and in Sydney, I have been unable to find the conveyance to Grant, or a memorial of it, but there is no doubt about his title,

(1) In the diary of the late G. T. W. B. Boyes there are two references to Cottage Green, viz.—
Vol. VI, 1840, 26 Feb.: 'Walked down to Cottage Green and made a sketch of the New Customs House and surrounding objects'.
Vol. VIII, 1846, 1 May: 'Went to look at Cottage Green—a miserable hole'.

which was confirmed in 1840, as will appear later. The Tasmanian Act providing for registration of transactions in land did not come into operation until 1827, which accounts for the absence of the memorial here. (5 Geo. IV No. 5.)

2. In a 'Hobart Town Gazette', published not long after the sale, it was announced that James Grant of Tullochgorum had purchased 'The Cottage and three acres close to the site of the intended New Wharf and Customs House'.

This information was given to me by Miss Wayn, Government Research Officer, from her card index of records, but, although I have made searches I have not been able to verify the announcement from the Gazettes myself, and Miss Wayn cannot remember where she found it, though she has no doubt about its accuracy.

It is important because it shows that at that time there was a 'Cottage' on the three-acre allotment. I think it fair to assume that this 'Cottage' was the fourth building, already referred to, shown on the chart of Sullivan's Cove and also in the sketch in the Hobart Town Magazine of 1834.

3. Dr. Ross, in his Almanac of 1831, p. 64, already mentioned, enumerates the houses then standing on the peninsula towards Mulgrave Battery. Besides Mr. O'Connor's residence, Cottage Green (i.e., Cottage Green No. 1), he speaks of two others, viz., the Villa of Mr. Read, Managing Director of the Bank of V.D.L., and the Villa of Mr. Grant. Evidently the latter was the cottage on the three-acre block, mentioned in the Gazette.

4. The construction in 1831 of Montpelier Retreat gave Mr. Grant's block frontages on that street.

5. Grant advertised in the 'Hobart Town Courier', 18th April, 1834, as follows:—

'TO CARPENTERS JOINERS AND PLASTERERS

TENDERS required for finishing three rooms about to be added to the Cottage of the undersigned. A plan and specifications may be seen at his office Cottage Green near the New Wharf.

April 17, 1834. JAMES GRANT.'.

Note that the 'Villa' of Dr. Ross was called by its owner in 1834 'Cottage Green'.

6. Grant, like Arthur, was evidently not satisfied with his title under the Location Order, for in 1840 he applied for a grant of the three acres, which was issued to him in that year. (5th Sept., 1840, 7/118.)

In this grant the three acres are described as follows:—

'Bounded on the North West by 120 links along the New Wharf.

On the S.E. by 1560 links along an allotment granted to Andrew Haig to Hampden Road' (i.e., 'Narryna').

On the South West by 253¾ links along Hampden Road and by a concave line whose curve is 94 links and whose versed line is 14 lks to Montpelier Retreat.

Again on the N.W. by 632 lks along Montpelier Retreat.

On the North East by 136 lks along a Grant to Thomas Hewitt.

And again on the North West by 826 lks along that allotment to the New Wharf'.

7. Between the years 1840 and 1850 two streets were laid out through this three-acre block—St. James-street, running west to east from Hampden-road towards the New Wharf, and Grant-street (now Knopwood-street) running north to South from Montpelier Retreat towards 'Narryna'.

8. In the 'Hobart Town Courier', of 23 August, 1845, appears the following advertisement:—

> TO BE LET on Lease at Cottage Green Mr. Grant's House and Garden now in the occupation of Mr. Perry. The House consists of 12 apartments with kitchen, scullery, stable, coachhouse, fuel-house and cellars.
>
> The situation is respectable, picturesque, quiet and sheltered, and although in the midst of Town possesses most of the advantages of a country residence'.

At first sight I found it difficult to reconcile this rather pretentious description with the present modest-looking dwelling in Knopwood-street. The house, we know, has been altered in fairly recent years, and, though I am informed that it contains something like twelve rooms, some of them are undoubtedly modern. But the rest of the house is obviously very old, and the outbuildings might well have been stable, coach-house and fuel-house; and the cellars, of great antiquity, are still there. As will be seen, the house changed hands several times in later years and the owners pulled down and rebuilt parts of the dwelling which had fallen into disrepair.

If it was not the present cottage, what was it, and where was it?

I have not been able to discover a trace of any other dwelling on the Cottage Green estate owned by James Grant at the date of the advertisement.

9. In the 'Hobart Town Courier', 7th October, 1848, James Grant advertises the forthcoming sale of:—

> 'The whole of the Cottage Green property in allotments extending from the New Wharf to Harrington Street, with considerable frontages on Montpelier Retreat. One of the lots includes the Dwelling House now rented by H.M. Commissariat Department.
>
> A constantly flowing spring runs through the front lots, affording an abundant supply for the whole in the driest season.
>
> As the frontage on the New Wharf is nearly all occupied, men of businesss will perceive the advantage of securing a centrical [*sic*] position.
>
> Montpelier Street is the Principal communication with the Wharf and shipbuilding establishments.
>
> Plan at Auctioneers.'

The wording of this advertisement puzzled me. Does it refer to the three acres purchased by Grant in 1824, and was the dwelling house then rented by the Commissariat Department 'Cottage Green No. 2'?

The three-acre block extended from the New Wharf to Hampden-road, not to Harrington-street, as stated in the advertisement, and I have not been able to discover whether the Commissariat Department ever rented Cottage Green No. 2, though Grant may have let it to them in pursuance of his advertisement of 1845.

On the other hand, there were still frontages of the three-acre block available on Montpelier Retreat, and search discloses that Grant disposed of a number of allotments fronting on Hampden-road and Montpelier Retreat and also of Cottage Green No. 2 between the years 1848 and 1851.

Moreover, the 'constantly flowing spring', though covered over by that time by Montpelier Retreat, no doubt still ran underground through the lower blocks and could be tapped by residents.

Also, search discloses no other land fronting on Harrington-street or Montpelier Retreat then owned by James Grant.

The plan mentioned in the advertisement, which would, of course, settle the question, is unfortunately not now available.

On the whole, I have come to the conclusion, justifiably, I think, that the property described in the advertisement was the three acres, or the balance thereof then remaining, purchased by Grant in 1824, and that the dwelling house referred to was Cottage Green No. 2.

10. In 1850 James Grant sold to William Richardson portion of the three-acre block comprising 1r. 27p. fronting on Grant-street and St. James-street, together with the dwelling house thereon erected. (9 Jan., 1850, 3/5009.)

11. In 1853 Wm. Richardson sold the 1r. 27p., together with the dwelling house thereon erected, to Edward Butler, formerly of George Town, licensed victualler, who, three months later, bought from Grant another portion of the land which adjoined the land on which the cottage stood. (3 Jan., 1853, 3/7425; 30 April, 1853, 3/8068.)

12. In July, 1853, Edward Butler sold the 1r. 27p., together with the dwelling house to Alexander Gellie for £1460.

In the description of the land conveyed by this indenture, five of the boundary lines are stated to be ' all on the outer side of the buildings intended to be conveyed '. (15 July, 1853, 3/8385.)

These five boundary lines correspond with the outer walls of the outbuildings at present standing on the property.

A glance at the plan drawn on the conveyance will show these five boundary lines.

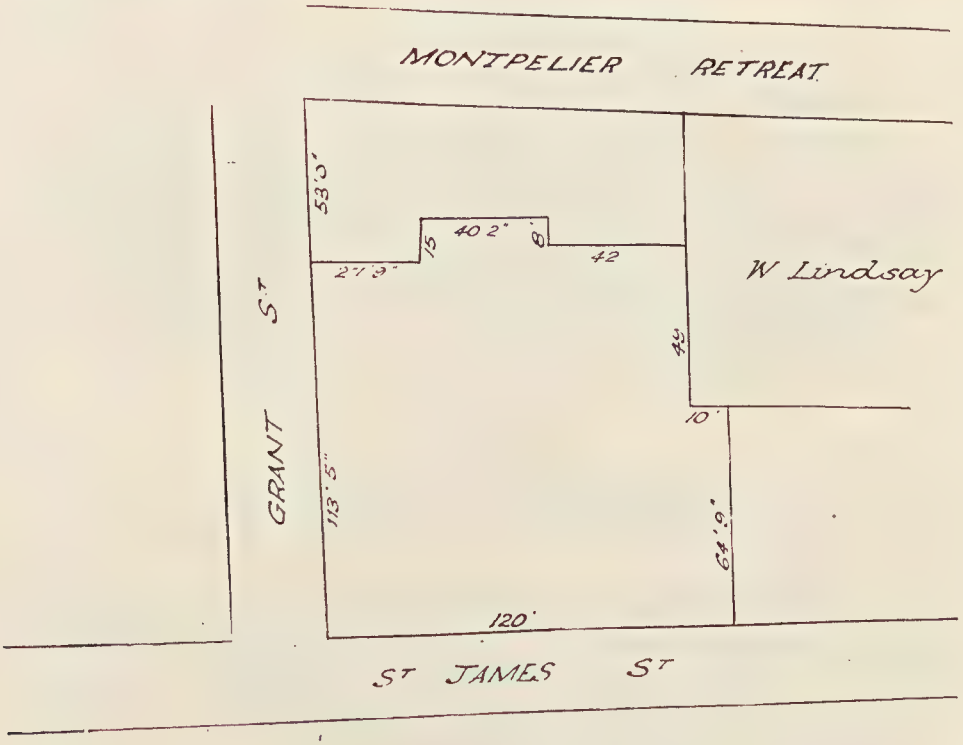


Fig. 1.— Plan on Conveyance 3/7425

An examination of the premises shows the following buildings, or remains of buildings, on the north-west boundary:—

(1) An old rubble-walled building with a fireplace, obviously of great antiquity (A).

(2) An old brick stable, or harness-room, or coach-house (B).

The measurements of these two buildings correspond with the boundary lines shown in the plan on the conveyance to Edward Butler of 1853.

(3) In addition to these, the so-called 'Potting-shed' is also very old. On its walls are shreds of a handsome wall paper, from which one infers that it may once have been a drawing room (C).

(4) The cellars and western side of the present dwelling are also undoubtedly of great age.

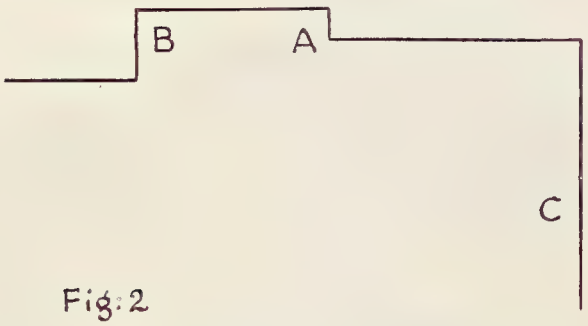


Fig. 2

13. In 1858 the whole property, including the adjoining land bought by Edward Butler in April, 1853, was purchased by Thomas Johnston (6 Sept., 1858, 4/6341) who lived there for about thirty-three years. In 1896 it was purchased by Charlotte Constance Bidencope. (5 Dec., 1896, 9/6094.)

14. Finally, in 1919, it changed hands again and was sold to Winifred Emmaline Isabel Boyes and Margaret Louisa Solomon. (10 June, 1919, 14/5307.)

Miss Winifred Boyes is the present owner.

Oral Evidence

As so often happens in investigating ancient history, personal recollections are scarce and unreliable, and chiefly based on hearsay.

In this case there are two sources of information—the Johnston family and the Bidencope family.

Mr. Archie Johnston, whose grandfather owned the property from 1858 to 1891, tells me that his father, now aged about 94, and whose memory goes back to 1860, says that Cottage Green No. 2 was undoubtedly occupied by Robert Knopwood, and that parts of the original buildings are still standing.

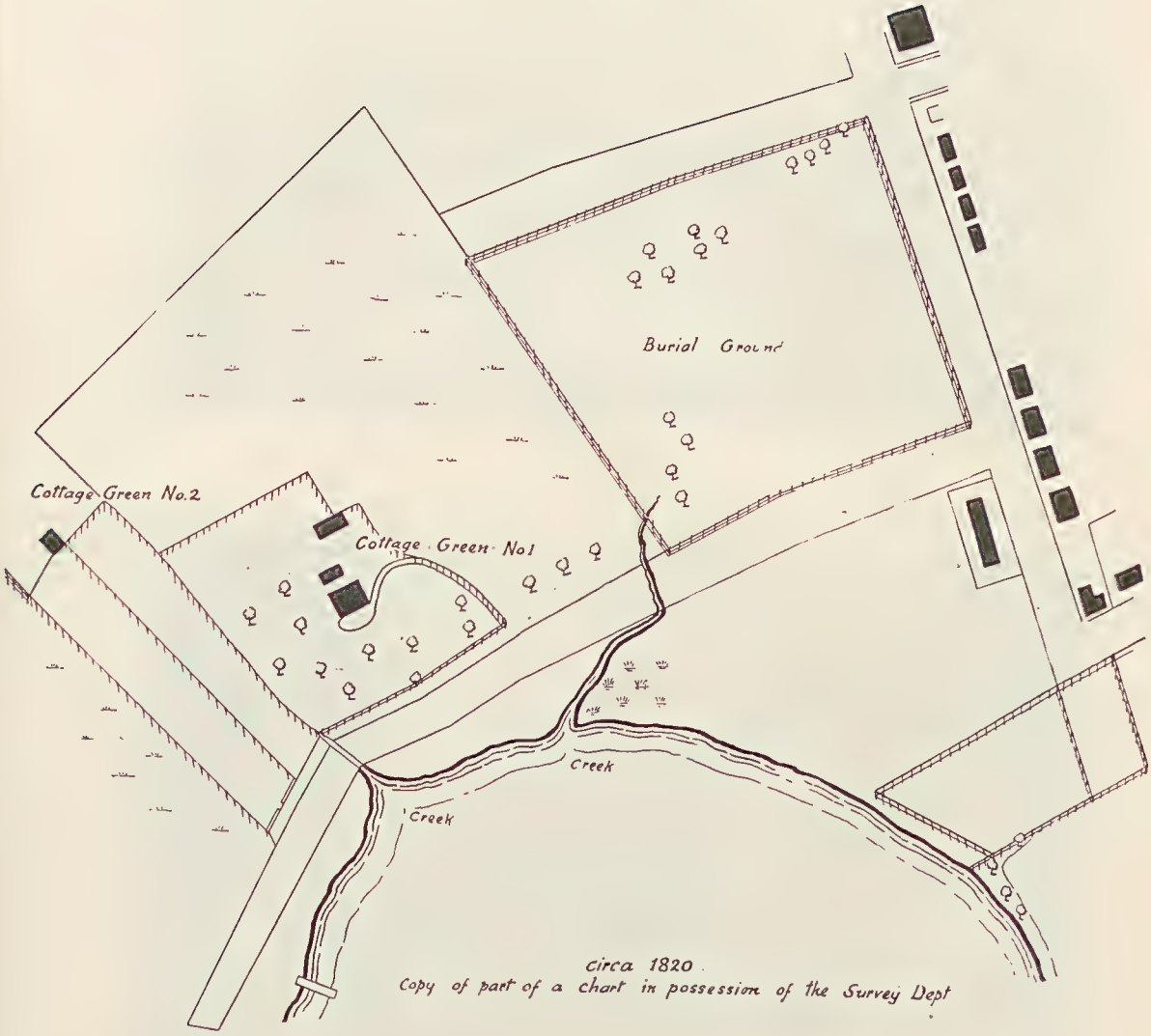
Mr. Z. Bidencope, whose mother bought the place in 1896, says that his father believed the same, and that the old potting shed and the outbuildings were always supposed to be the remains of the original building.

Conclusion

From this rather scanty array of facts, I think that the following conclusions may be drawn:—

1. The land on which Cottage Green No. 2 stands was originally part of the thirty acres located to Knopwood in 1806.
2. As far back as the date of the earliest chart of Sullivan's Cove in the Surveys Department (i.e., in 1820, or thereabouts) there was a small building on the land, which was presumably erected by Knopwood. Whether any trace of this building now remains it is impossible to say.
3. When James Grant bought the land in 1824 there was a building on it, which was important enough to be called a 'cottage' then, and a 'villa' in 1831. This cottage was added to by Grant in 1834 and let by him in 1845, and again in 1848. It then contained twelve rooms, with offices, including stable, coach-house, fuel-house and cellars. In 1850 it was sold by Grant to Wm. Richardson, from whom it has come down to the present owners.
4. According to the Johnston family, the older parts of the present buildings, including the so-called 'Potting-shed', and outbuildings were in existence in 1858, and have always been reputed to be part of the original buildings. This evidence corroborates the statement in the conveyance to Gellie in 1853 and the plan on the conveyance to Butler in the same year.
5. There is no documentary evidence that Knopwood himself ever occupied any portion of Cottage Green No. 2. On the contrary, up till 1831 he was occupying, or entitled to occupy, Cottage Green No. 1. Moreover, James Grant had bought Cottage Green No. 2 in 1824, and was apparently living there himself in 1831, by which time Knopwood had gone to live on the eastern side of the Derwent, in the Parish of Clarence. Though we cannot prove from the records available that Knopwood ever lived in the house in the flesh, there would seem to be sufficient evidence of his association with it to entitle his ghost, if it wishes to do so, to wander among the trees and shrubs of the garden. And, as he paces the mossy paths and gazes out over the blue waters of the river below, where whales sport no more, and whalers no longer tie up to the wharves, let us leave him to meditate upon the changes that Time has brought to the little settlement on the Derwent he knew and loved, and to reflect upon the impermanence of all earthly possessions.

PLATE IV



circa 1820.
Copy of part of a chart in possession of the Survey Dept

Plate V

Fig. 1.—Cottage Green No. 1, 1834.

Fig. 2.—Montpelier Retreat, present day, shewing old buildings seen in fig. 1.

Fig. 1.

Fig. 2.

PLATE VI

FIG. 1.—Cottage Green No. 2, c. 1865.

FIG. 2.—Cottage Green No. 2, present day.

Fig. 1.

Fig. 2.

INDEX TO PAPERS

published in the Papers and Proceedings of the Royal Society of Tasmania

1898-1944

AUTHOR INDEX

(Subject index will be printed in 1946 Volume)

AIKENHEAD, W.—Lightning Flashes. 1898-1899, p. xxxvii.
AISTON, G.—Chipped Stone Tools of the Aboriginal Tribes North-East of Lake Eyre, South Australia. 1928, p. 123.
————————Method of Mounting Stone Tools on Koondi. Tribes East and North-East of Lake Eyre. 1929, p. 44.
————————Magic Stones of the Tribes East and North-East of Lake Eyre. 1929, p. 47.
ANGEL, S.—Notes on the Last of the Tasmanian Race. 1938, p. 232.
ANON.—Antarctic Expedition, Sir Geo. Newnes, Southern Cross. 1898-1899, pp. xvi, 115..
————Sir J. W. Agnew—Obituary. 1900-1901, p. 141.
————Alex. Morton—In Memoriam. 1907, p. xlvii.
————R. M. Johnston, I.S.O., F.S.S.—Obituary. 1918, p. 136.
————Colonel W. V. Legge—Obituary. 1918, p. 142.
————Leonard Rodway—Obituary. 1936, p. 94.
ARCHER, F. H.—Temperature of the Great Lake for the Month of June. 1902, p. xxv.
————————Temperature of the Great Lake for the Month of July. 1902, p. xxvii.
————————Birds at North Great Lake. 1902, p. xxvii.
————————Spawning of Fish at Great Lake. 1902, p. xxx.
ASHBY, EDWIN.—Description of a New Species of Fossil Loricella. 1921, p. 37.
————————Notes on and Additions to the Chiton Fauna of the North-West Tasmania, together with a brief review of the Genus *Stenochiton*. 1926, p. 92.
————————Definition of a New Fossil Chiton. 1929, p. 36.
ASHBY, ERIC.—A Century of Ideas on Evolution. 1943, p. 159.
BAKER, H.—Habits of Mutton Birds. 1908, p. vii.
BAKER, R. T. & SMITH, H. G.—A Research on the Eucalypts and Their Essential Oils. 1912, p. 139.
BARNARD, L. E.—Romance of Tasman's Peninsula. 1940, p. 86.
BEATTIE, J. W.—Notes on a Visit to Port Davey. 1898, p. iii.
————————Hartz Mountains and the Picton. 1899, p. xxxv.
————————West Coast Mining Fields. 1899, p. xxxix.
————————Notes on a Trip to the Barn Bluff Country. 1900-1901, p. xxv.
————————Notes on the River Gordon and the Need for Reservation of Land along its Banks. 1908, pp. viii and 31.
————————List of Native Words of the Oyster Bay Tribe, Van Diemen's Land. 1913, p. 79.
————————A Tasmanian Aboriginal Skull Found on Tasman Island. 1913, p. 287.
BELL, C. NAPIER.—Macquarie Harbour: Its Physical Aspect and Future Prospects. 1898-1899, p. xxviii.
BENJAMIN, L. R. S.—Some Aspects of the Development of the Eucalyptus Pulping Industry and the Manufacture of Newsprint. 1941, p. 83.
BENSON, W. NOEL.—Notes on the Geology of the Cradle Mountain District. 1916, p. 29.
BLACK, R. A.—Contributions to the Flora of Tasmania. 1916, p. 144.
BLACKBURN, M.—Developing Our Fisheries. 1944, p. 124.
BLACKMAN, A. E.—Weighing the Earth. 1910, p. 376.
————————An Original and Independent Method of Extracting Roots of Numbers. 1928, p. 160.
BLOCHMANN, F.—Some Australian Brachiopods. 1913, p. 112.
BOAG, J. B.—Textile Dyeing. 1941, p. 85.

BOND, P. H.—Science and the Farmer. 1939, p. 142.
————————Synthetic Rubber. 1942, p. 171.
BOOT, J. A.—Tasman's Early Life and Discoveries. 1942, p. 169.
BOSWELL, R.—Modern Museum Display Methods. 1941, p. 84.
BOURNE, G.—A New Protozoan Parasite from a Bdellid Mite. 1932, p. 10.
BOWDEN, F. P.—Polishing and the Sliding of Ski. 1939, p. 137.
BRETT, R. G.—A Survey of *Eucalyptus* species in Tasmania. 1937, p. 75.
————————The Description of a New Eucalypt Species. 1938, p. 129.
————————Identification of Eucalypts in the Field. 1939, p. 136.
BRIGGS, E. A.—Notes on Tasmanian Caprellidae. 1914, p. 75.
BROOKS, G. V.—Observations on Educational Institutions in the United States of America, Canada, England, Scotland, and Ireland. 1936, p. 99.
BROTHERS, C. R.—Eugenics: The Medical Aspect. 1941, p. 78.
BURBURY, F. E.—Tasmanian Diatomaceae. 1900-1901, p. 4.
BUTLER, A. L.—The Life and Work of John Gould. 1938, p. 233.
BUTLER, W. F. D.—The Foundations of Public Institutions for Secondary Education in Tasmania. 1917, p. 21.
————————A Five-Rupee Gold Coin of the East India Company. 1939, p. 140.
BUTLER, W. F. D., GIBLIN, L. F., & HUTCHINSON, H. R.—A Determination of the Height of Barn Bluff. 1917, p. 1.
CANE, R. F.—Studies in Tasmanite Shale Oil. 1940, p. 23.
————————The Nitrogen Bases in Tasmanite Shale Oil. 1941, p. 55.
CANE, R. F. & STEPHENS, C. G.—The Soils and General Ecology of the North-East Coastal Regions of Tasmania. 1938, p. 201.
CARPENTER, F. M.—A New Genus of Mecoptera from Tasmania. 1940, p. 51.
CERUTTY, L.—Science and Utopia. 1937, p. 152.
————————Francis Bacon. 1940, p. 83.
CHAPMAN, F.—On a Supposed Phyllocarid from the Older Palaeozoic of Tasmania. 1925, p. 79.
————————On Some Remarkable Annelid Remains from Arthur River, N.W. Tasmania. 1928, p. 1.
————————Report on a Collection of Fossils from Marrawah, Smithton. 1940, p. 16 (Appendix).
CHILTON, CHAS.—Note on the Occurrence in Tasmania of the Freshwater Crab, *Hymenosoma lacustris*. 1919, p. 93.
CLARK, ELLEN.—Tasmanian Parastacidae. 1938, p. 117.
CLARKE, ARTHUR H.—Description and Measurements of Some Mallicolo Crania. 1898-1899, p. 106.
CLELAND, J. B.—Some Aspects of the Ecology of the Aboriginal Inhabitants of Tasmania and Southern Australia. 1939, p. 1.
CLELAND, J. B. & RODWAY, L.—Notes on the Genus *Poria*. 1928, p. 31.
————————Notes on the Genus *Poria*, No. 2. 1928, p. 73.
————————Notes on the Genus *Poria*, No. 3. 1929, p. 7.
CLEMES, W. H.—Notes on the Geology of Wineglass Bay. 1919, p. 18.
————————Notes on the Geology of Maria Island. 1919, p. 33.
————————Notes on a Geological Reconnaissance of the Lake St. Clair District. 1924, p. 59.
————————Discussion on 'Note on the Isostatic Background of Tasmanian Physiography' by A. N. Lewis. 1927, p. 69.
COLLIER, J. D. A.—Social Life in Van Diemen's Land in the Early Days. 1943, p. 239.
COOKSON, I. C.—The Occurrence of Fossil Plants at Warrentinna, Tasmania. 1936, p. 73.
COUNSEL, J. M.—The Italian Foundations of Painting from Michelangelo to Giotto. 1937, p. 151.
COWELL, J. FORREST, Secretary of Royal College of Surgeons—Skull of William Lannee. 1903, p. xxxix.
CRAIG, C.—Some Notes on the History of the Launceston General Hospital. 1943, p. 247.
————————Early Town Planning in Hobart. 1944, p. 99.
CRESPIN, I.—Middle Miocene Limestone from Cape Barren Island. 1944, p. 13.
————————Middle Miocene Limestones from King Island. 1944, p. 15.
CROWCROFT, P. W.—New Trematodes from Tasmanian Fishes. 1944, p. 61.
CROWTHER, W. E. L. H.—Notes on the Habits of the Extinct Tasmanian Race. 1924, p. 136.
————————Notes on the Habits of the Extinct Tasmanian Race, Number 2. 1926, p. 165.
————————Notes on the Habits of the Extinct Tasmanian Race, Number 3: Disposal of Their Dead. 1933, p. 22.
————————Notes on the Habits of the Extinct Tasmanian Race, Number 4. 1938, p. 209.
————————On Two Tasmanian Crania (Immature). 1929, p. 123.
————————Notes on Tasmanian Whaling. 1919, p. 130.
————————Voyage of the 'Mary and Sally' to Macquarie Island for the Purpose of Obtaining Sea Elephant Oil and Seal Skins. 1932, p. 39.

CROWTHER, W. E. L. H.—A Sealing Voyage to Bass Strait by the Schooner 'Brothers' in 1813. 1936, p. 79.
———The Development of the Guano Trade from Hobart Town in the Fifties and Sixties. 1938, p. 213.
———Abel Janzoon Tasman. 1942, p. 169.
———Arndell Neil Lewis, M.C., LL.D. Obituary Notice. 1943, p. 248.
CROWTHER, W. L. & LORD, CLIVE.—A Descriptive Catalogue of the Osteological Specimens Relating to the Tasmanian Aborigines Contained in the Tasmanian Museum. 1920, p. 137.
———Description of Two Tasmanian Aboriginal Crania. 1921, p. 168.
CRUICKSHANK, F. D. & McAULAY, A. L.—The Male Meiotic Cycle in the Genus *Eucalyptus*. 1937, p. 41.
CURTIS, WINIFRED M.—Observations on the Stem Anatomy of the Genus *Richea*. 1940, p. 33.
———*Spartina townsendii*, its History and Economic Value in Reclaiming Tidal Mud. 1940, p. 80.
———Plant Hormones. 1944, p. 131.
———Variations in *Pultenaea juniperina* Labill. 1943, p. 197.
DAKIN, W. J.—R. M. Johnston Memorial Lecture: Science and Sea Fisheries with Special Reference to Australia. 1934, p. 1.
DALLAS, K. M.—The Study of Economic Science. 1935, p. 196.
DAVID, Prof. T. W. EDGEWORTH.—R. M. Johnston Memorial Lecture: Geological Evidence of the Antiquity of Man in the Commonwealth with Special Reference to the Tasmanian Aborigines. 1923, p. 109.
DAVIS, CONSETT.—Preliminary Survey of the Vegetation near New Harbour, South-West Tasmania. 1940. p. 1.
DE WESSELOW, F. G. SIMPKINSON.—Valuable Works of Art. 1900, p. x.
DIXON, H. N. & RODWAY, L.—On *Phascus tasmanicum*. 1922, p. 176.
DOBSON, HENRY.—The Northern Territory. 1906-1907, p. xliii.
DOVE, H. STUART.—On Certain Types of Stone Used by the Aborigines. 1910, p. 262.
———On the Connection of Swifts with Weather. 1911, p. xix (Abstract) and p. 99 (Paper).
———Additional Notes on Stones Used by the Aborigines. 1914, p. 87.
———On the Sporophore of the Native Bread (*Polyporus mylitta*). 1930, p. 94.
———On an Unusual Form of Stone from a Tasmanian Native Camp. 1933, p. 20.
DOWSETT, W. T.—Social Services and Their Importance in War Time and Postwar Period. 1942, p. 165.
DUNBABIN, A. L.—Aristotle, the Father of Science. 1944, p. 127.
DUNBABIN, THOMAS.—France and Australia. "The Prise de Possession." 1921, p. 147.
DUNCAN, C.—Human Blood Groups. 1944, p. 124.
EDWARDS, A. B.—The Age and Physiographical Relationships of Some Cainozoic Basalts in Central and Eastern Tasmania. 1938, p. 175.
———On a Remnant of a Stripped Peneplain of Palaeozoic Age at Mt. Sedgwick in Western Tasmania. 1940, p. 19.
ELKINGTON, J. S. C.—Some Social and Economic Aspects of Public Health Work. 1903-1905, p. liii.
———Tropical Australia—Is it Fitted for a White Race? 1903-1905, p. lxiii.
———Some Relations of Insects to Human Diseases. 1903-1905, pp. 113 and xxvii.
———School Hygiene. 1906-1907, p. ix.
ELLIOTT, J. R.—Infinity and the Greek Mind. 1943, p. 239.
EMMETT, E. T.—Tasmania's Oldest Road. 1939, p. 139.
———Early Days of New Norfolk. 1940, p. 81.
———Frenchman's Cap. 1942, p. 166.
ETHERIDGE, ROBERT, Jun.—Description of a Tasmanian Species of *Halysites*. 1898-1899, p. 81.
EVANS, J. W.—The Bythoscopidea of Australia. (Homoptera, Jassoidea), 1935, p. 61.
———Australian Leaf-Hoppers (Homoptera, Jassoidea), Part 4, (Ledridae, Ulopidae and Euscelidae, Paradorydiini). 1936, p. 37.
———Australian Leaf-Hoppers. (Homoptera, Jassoidea), Part 5. Euscelidae (in part). 1936, p. 51.
———Australian Leaf-Hoppers. (Homoptera, Jassoidea), Part 8. 1938, p. 1.
———A Contribution to the Study of the Jassoidea (Homoptera). 1938, p. 19.
———New Leaf-Hoppers from Tasmania and Queensland. 1941, p. 27.
———The Morphology of the Head of Homoptera. 1937, p. 1.
———The Morphology of *Tettigarcta tomentosa* White, (Homoptera, Cicadidae). 1940, p. 35.
———The Phylogeny of the Homoptera. 1941, p. 37.
———A Mecopterous Larva from Tasmania and Notes on the Morphology of the Insect Head. 1941. p. 31.
———The Scope of Applied Entomology. 1936, p. 99.
———Forest Entomology (Abstract). 1937, p. 154.
———Tasmanian Biological Survey. 1938, p. 235.

EVANS, J. W.—Recent Progress in Entomology in Tasmania. 1941, p. 77.
———————The Life and Achievements of Charles Darwin. 1943, p. 238.
FERNYHOUGH, F.—The Evolution of Domestic Chair Design. 1944, p. 125.
FLYNN, T. T.—Points in the Anatomy of Certain Megapodes. 1909, p. 175.
———————Notes on the Marsupialian Anatomy. 1: On the Conditions of the Medium Septum in the Trichosuridae. 1911, p. 120.
———————Notes on Marsupialian Anatomy. II: On the Female Genital Organs of a Virgin *Sarcophilus satanicus*. 1911, p. 144.
———————On a Pycnogonid of the Genus *Halosoma*. 1918, p. 11.
———————Two New Australian Pycnogonida. 1918, p. 91.
———————A Re-Examination of Professor Haswell's Types of Australian Pycnogonida. 1919, p. 70.
———————On a Freshwater Sponge from Tasmania. 1922, p. 58.
———————Two Hydromedusoid Records for Tasmania. 1926, p. 91.
FLYNN, T. T. NOETLING, F., & RODWAY, L.—Land Connections with Antarctica. 1914, p. 88.
FRANKLIN, LADY—Extracts from Diary: Excursion to Port Davey. 1925, Appx. 1.
GIBLIN, L. F.—Demography of Tasmania. 1913, p. 173.
———————Discussion on 'Note on the Isostatic Background of Tasmanian Physiography' by A. N. Lewis. 1927, p. 69.
———————General Survey of Developments of Tasmanian Economy, its Present Position and Prospect. 1936, p. 101.
GIBLIN, L. F. & PIESSE, E. L.—The Ben Lomond Range—Notes on the Height of Legge Tor. 1906-1907, p. xxxvii.
GIBLIN, L. F., PIESSE, E. L., & HUTCHINSON, H. R.—The Height of Ben Lomond. 1913, p. 5.
———————————————————Note on Strzelecki's Determination of Heights in Tasmania. 1913, p. 116.
GIBLIN, L. F., BUTLER, W. F. D., & HUTCHINSON, H. R.—A Determination of the Height of Barn Bluff. 1917, p. 1.
GIBLIN, R. W.—Notes on the Journal of Captain Charles O'Hara Booth. 1925, p. 152.
———————Flinders, Baudin and Brown at Encounter Bay. 1929, p. 1.
———————Robert Brown at Port Dalrymple. 1929, p. 25.
GLASSON, J. L.—On the Relation between the Loss of Energy and the Ionisation Produced by Cathode Rays. 1913, p. 1.
GOLDSTONE, C. L.—The Menace of Soil Erosion. 1941, p. 85.
GORDON, H. D.—Seaweeds. 1938, p. 230.
———————*Polyporus mylittae*. 1939, p. 135.
———————The Vegetation of the Beach. 1940, p. 80.
GREEN, A. O.—Tasmanian Timber. 1900-1901, p. xviii.
———————The Timber Industry. 1902, p. 35.
———————Tasmania from a Manufacturing and Immigration Point of View and Her Natural Advantages. 1903-1905, p. 49.
———————Notes Taken at Bellerive at the Time of the Recent Eclipse of the Sun. 1910, p. iv.
HALL, R.—Russian Fauna. 1908, p. ii (In Account of Travels).
———————The Distribution of Australian Land Birds. 1910, p. ix (Abstract) and p. 314 (Paper).
———————The Feather-Tracts of *Sphenura broadbenti* McCoy. 1911, p. xi (Abstract) & p. 33 (Paper).
———————Note on *Trachinops taeniatus*. 1911, p. xix, and p. 32.
———————Migratory Birds. 1912, p. xvii (Exhibits and Notes).
———————Notes on Derwent Estuary Fishes. 1912, p. 79.
HALL, T. S.—Evidence of Graptolites in Tasmania. 1902, p. 16.
HALLIGAN, G. H.—Tasman's Landing Place. 1925, p. 195.
HAMILTON, J. BRUCE.—Inheritance of Visual Defects. 1939, p. 138.
HARDY, G. H.—List of Tenison Woods' Types of Recent Mollusca in the Tasmanian Museum. 1915, p. 61.
———————Notes on the Genus *Pelecorhynchus*. 1915, p. 60.
———————A New Gall-making Thrip. 1915, p. 102.
———————A Further Exhibit of Supposed Cases of Mimicry. 1915, p. 113.
———————A New Tasmanian Butterfly and a List of Known Tasmanian Species. 1916, p. 146.
———————Notes on Tasmanian Diptera and Descriptions of New Species. 1916, p. 267.
———————Notes on Tasmanian Diptera and Descriptions of New Species. 1917, p. 60.
———————Notes on Tasmanian Butterflies. 1917, p. 67.
———————Tasmanian Cicadidae. 1917, p. 69.
———————Australian Rhyphidae and Leptidae (Diptera). 1917, p. 117.
———————Australian Stratiomyidae. 1920, p. 33.
———————Australian Bombyliidae and Cyrtidae. 1921, p. 41.
———————Notes on Australian Bombyliidae, Mostly from the Manuscript of the late Arthur White. 1923, p. 72.
HARRISON, C. H.—Some Notes on the Propagation of the Cucumber Herring. 1906-1907, p. xi.
HARRISON, M.—Egg of a Pallid Cuckoo in Nest of Goldfinch. 1900-1901, p. xiii.

HAYTER, F. T.—Army Signalling. 1903-1905, p. li.
HEATON, H.—The Early Tasmanian Press and Its Struggle for Freedom. 1916, p. 1.
HEDLEY, C.—Notes on Tasmanian Conchology. 1902, p. 77.
———————Tasmanian Relics in the Havre Museum. 1914, p. 81.
HENDERSON, Q. J. & THOMAS, D. E.—Some Fossils from the Dundas Series, Dundas. 1944, p. 1.
HERBERT, D. A.—The Parasitism of *Exocarpus humifusa*. 1928, p. 28.
HEYN, W.—The Present and Future Prospects of Timber in Tasmania. 1900-1901, p. 21, pp. xv, xvii.
———————Suggestions for the Establishment of a Tasmanian School of Forestry and Agriculture. 1902, p. 1.
HEYWARD, F.—Preliminary Notes on a Rock Shelter in Eastern Tasmania. 1933, p. 28.
HICKMAN, V. V.—Notes on Tasmanian Araneidae with a Description of a New Species. 1925, p. 171.
———————Studies in Tasmanian Spiders, Part 1. 1926, p. 52.
———————Studies in Tasmanian Spiders, Part 2. 1927, p. 158.
———————Studies in Tasmanian Spiders, Part 3. 1928, p. 96.
———————Studies in Tasmanian Spiders, Part 4. 1929, p. 87.
———————Studies in Tasmanian Spiders, Part 5. 1931, p. 20.
———————A New Mygalomorph Spider Belonging to the Genus *Hexathele* Ausserer. 1935, p. 131.
———————The Toxopidae, a New Family of Spiders. 1939, p. 125.
———————On Some New Hadrotarsidae (Araneae) with Notes on Their Internal Anatomy. 1942, p. 147.
———————On Some New Australian Apneumonomorphae with Notes on Their Respiratory System. 1943, p. 179.
———————The Embryology of the Syncarid Crustacean, *Anaspides tasmaniae*. 1936, p. 1.
———————Some Abnormal Conditions of the Reproductive System of the Saltwater Crayfish. 1944, p. 57.
———————A Contribution to the Study of Tasmanian Copeognatha. 1933, p. 77.
———————The Cryptozoic Fauna of Mt. Wellington. 1935, p. 199.
———————Tasmanian Biological Survey. 1938, p. 235.
———————*Geotria australis* Gray. 1939, p. 135.
———————A New Ichthyobdellid Leech and its Egg-capsules. 1941, p. 41.
———————Ernest Ewart Unwin, M.Sc. Obituary Notice. 1944, p. 133.
HICKMAN, V. V. & SCOTT, E. O. G.—The Occurrence of the Freshwater Polyzoan, *Plumatella repens* (Van Beneden), in Tasmania. 1932, p. 7.
HILL, DOROTHY.—Some Tasmanian Palaeozoic Corals. 1941, p. 3.
HILLS, LOFTUS—The Progress of Geological Research in Tasmania since 1902. 1921, p. iii.
HOCKEN, Dr.—Japan: Its People and Industries. 1903-1905, p. xxxiii.
HOGG, E. G.—The Falls of Niagara as a Geological Chronometer. 1900-1901, p. iii.
———————The Glacial Beds of Little Peppermint Bay, Tasmania. 1900-1901, p. 45.
———————Magnetic Survey of Tasmania. 1900-1901, pp. iv & 85.
———————On Certain Calcareous Nodules. 1902, pp. 136 & xxx.
———————The Glacial Beds of Port Cygnet. 1903-1905, p. xxxvi.
———————Note on Itacolumite of Flexible Sandstone. 1900-1901, p. 134.
HOGG, E. G. & WALLER, G. A.—The Tourmaline-Bearing Rocks of the Heemskirk District. 1902, p. 143.
HOGG, G. H.—D'Entrecasteaux: An Account of His Life, His Expedition and His Officers. 1937, p. 53.
HOLMAN, W. P.—A Short History of the Application of Rays in Medicine. 1939, p. 141.
HORNE, Dr. GEORGE.—The Concave Stone Implements of the Tasmanian Aborigines. 1921, p. 182.
HUDSPETH, W. H.—Experiences of a Settler in the Early Days of Van Diemen's Land. 1935, p. 139.
———————As We Were. 1943, p. 243.
HUTCHINSON, H. R., GIBLIN, L. F., & BUTLER, W. F. D.—A Determination of the Height of Barn Bluff. 1917, p. 1.
HUTCHINSON, H. R., GIBLIN, L. F., & PIESSE, E. L.—The Height of Ben Lomond. 1913, p. 5.
———————————————————Note on Strzelecki's Determination of Heights in Tasmania. 1913, p. 116.
HUTCHINSON, N. L. & McAULAY, A. L.—The Penetrating Radiation in the Atmosphere at Hobart. 1924, p. 123.
INGLES, J. A.—Lighting and Other Natural Phenomena. 1939, p. 141.
IRELAND, E. W. J.—Skin Diseases Treated by Blood Vaccine. 1910, p. 370.
ISRAEL, G. C., KURTH, E. E., & RALPH, B. J.—Some Avenues of Chemical Research in Tasmania. 1944, p. 123.
JAEGER, J. C.—Charcoal: Its Properties and Production. 1942, p. 167.
JAEGER, J. C. & JOHNSON, CYNTHIA M.—A Study of the Carbonization of Some Tasmanian Timbers. 1941, p. 63.
JAMIESON, JAMES.—Typhoid in Hobart and Melbourne and the Influence of Drainage on its Prevalence. 1902, pp. xxxiii and 95.

JOHNSON, J. A.—The New Education. 1906-1907, p. xiii.
———————Recent Developments in Experimental Pedagogy. 1913, p. 288.
JOHNSON, CYNTHIA M. & JAEGER, J. C.—A Study of the Carbonization of Some Tasmanian Timbers. 1941, p. 63.
JOHNSTON, R. M.—Are All the Colossal Igneous Caps of the Tasmanian Tiers and of the Lofty Mountain Plateaux True Sills? 1898-1899, p. xlix.
———————Observations Regarding the Recent Discovery by G. Thureau, F.G.S., of a Fossil Reptile in the Mersey Coal Measures at Railton. 1900-1901, p. 9.
———————Coal Discovery at Wynyard. 1901, p. xxii.
———————Further Notes on the Permo-Carboniferous Fossil Cliffs at Darlington, Maria Island. 1900-1901, p. 11.
———————Notes on a New Tasmanian Fish. 1902, p. vi.
———————A New Fish. 1902, p. x.
———————Notes on the Fossil Flora and the Fossil Fish Discovered at Tinder Box Bay. 1903-1905, p. xxvi.
———————Some Remarks on *Spirifer triangularis*. 1903-1905, p. xxvi.
———————Notes on the Reidle Bay Conglomerates, Maria Island. 1903-1905, p. xxvi.
———————Notes on a Fossil Tree at Barnes Bay. 1903-1905, p. xxix.
———————List of Flowering Plants Collected at Kettering. 1903-1905, p. 38, & p. xvi.
———————South-Eastern Australian Mackerel, *Scomber antarcticus*. 1910, p. iv.
———————Notes on the Discovery of a New Fossil Fruit from the Deep-lead Tin Drifts at Derby, Tasmania. 1918, p. 3.
———————Proposed Psychometer Index Designed as an Aid to the Better Determination of Some Common Fungoid Illusions and of the Comparative Value of Mental Concepts. 1903-1905, p. 83 & p. xlvi.
———————The Ethical, Economical and Practical Aspects of Old Age Pensions. 1903-1905, p. 95 & p. lxiii.
———————Some Economic Aspects of the Eisenach Social Equality Programme. 1903-1905, p. 125 & p. xxxi.
———————Conditions upon which the Healthy Growth of the Population of Young Colonies Depend. 1903-1905, p. 27.
———————On State Borrowing and Sinking Funds for the Redemption of State Debts Regarded from an Economical Point of View. 1908, pp. v and 10.
———————Observations Regarding Accumulated Capital Wealth. 1918, p. 1.
JOHNSTON, R. M. & MORTON, A.—Notes on King Island and Recent Discoveries. 1906-1907, p. x.
JONES, F. WOOD.—The R. M. Johnston Memorial Lecture, 1925. The Mammalian Toilet and Some Considerations arising from it. 1925, p. 14.
———————A Re-Examination of the Skeletal Characters of *Wynyardia bassiana*, an Extinct Tasmanian Marsupial. 1930, p. 96.
JONES, J. F.—Aboriginal Rock Carvings Found at Trial Harbour. 1937, p. 47.
KEBLE, R. A.—Tasmanian Graptolite Record. 1928, p. 69.
KELLY, JAMES.—First Discovery of Port Davey and Macquarie Island. 1920, p. 160.
KIDSON, E.—The Completion of the General Magnetic Survey of Australia by the Carnegie Institution of Washington. 1921, p. 84.
KING, H. J.—Colour Photography in Tasmania. 1939, p. 141.
———————Colour Photography. 1940, p. 88.
———————Cine-Biology. 1943, p. 245.
KINGSMILL, H. G.—The Observatory. 1902, p. xi.
———————Astronomical Observations at Cape Town Observatory. 1901, p. xxiii.
———————Federal Meteorology. 1903-1905, p. xxxvii.
———————A New Range-Finder. 1903-1905, p. lxi.
———————On Solar Eclipses. 1908, p. xi.
KINGSMILL, H. G. & LEGGE, W. V.—Rainfall and Water Supply of the Great Lake. 1903-1905, p. xii.
KLATSCH, Dr.—Australian Aborigines. 1906-1907, p. xxvi.
KNIGHT, A. W.—Bridge Engineering. 1938, p. 234.
KOBAYASHI, TEIICHI.—Lower Ordovician Fossils from Junee, Tasmania. 1939, p. 61.
———————Lower Ordovician Fossils from Caroline Creek near Latrobe, Mersey River District, Tasmania. 1939, p. 67.
KURTH, E. E., ISRAEL, G. C., & RALPH, B. J.—Some Avenues for Chemical Research in Tasmania. 1944, p. 123.
LEA, A. M.—List of the Described Tasmanian Coleoptera. 1898-1899, p. li.
———————Notes on Some Remarkable Tasmanian Insects. (*Acrophylla tasmaniensis*). 1902, p. 81 and p. xxiv.
———————List of Described Coleoptera of Tasmania. 1903-1905, p. 1.
———————Notes on the Genus *Lissotes* with Descriptions of New Species. 1910, p. 346.

LEGGE, R. W.—Notes on a Series of 'Pounders' from Certain Localities of the West Coast of Tasmania. 1927, p. 25.
———————On Some Diminutive Types of Tasmanian Stone Implements. 1928, p. 87.
———————Tasmanian Stone Culture. Some Notes on Distinctive Types: Spokeshaves, Borers and Chipping Tools and Their Probable Usages. 1929, p. 39.
———————Note on the Birds of Tasmania. 1900-1901, p. 90.
———————The Tasmanian Emu. 1906, p. xi.
———————Note on Stone Knives of Tasmanian Aborigines. 1903-1905, p. xxxix.
———————Contribution to the Physiography of Tasmania. 1902, p. 138.
———————Note on the Ben Lomond Plateau and the Discovery of High Land at the North End. 1907, p. xxxiv.
———————A Rectification in the Cartography of North-Eastern Tasmania. 1913, p. 76.
LEGGE, W. V. & KINGSMILL, H. G.—Rainfall and Water Supply of the Great Lake. 1903-1905, p. xii.
LEWIS, A. N.—A Preliminary Sketch of the Glacial Remains Preserved in the National Park of Tasmania. 1921, p. 16.
———————A Supplementary Note to 'A Preliminary Sketch of the Glacial Remains Preserved in the National Park of Tasmania.' 1921, p. 177.
———————A Further Note on the Topography of Lake Fenton and District, National Park, Tasmania. 1922, p. 32.
———————Notes on a Geological Reconnaissance of Mt. Anne and the Weld River Valley, South-Western Tasmania. 1923, p. 9.
———————Notes on a Geological Reconnaissance of the Mount La Perouse Range. 1924, p. 8.
———————Notes on a Cliff Section near Cape Paul Lamanon. 1924, p. 45.
———————Note on the Isostatic Background of Tasmanian Physiography. 1926, p. 1.
———————Discussion on 'Note on the Isostatic Background of Tasmanian Physiography,' 1927, p. 66.
———————A Further Account of the Geology of the Catamaran Coal Fields. 1927, p. 188.
———————Note on the Origin of the Great Lake and Other Lakes on the Central Plateau. 1932, p. 15.
———————A Correlation of the Tasmanian Pleistocene Glacial Epochs and Deposits. 1933, p. 67.
———————A Correlation of the Tasmanian Pleistocene Raised Beaches and River Terraces in Unglaciated Areas. 1934, p. 75.
———————The Antiquity of Man in Tasmania. 1934, p. 83.
———————Our Pulsating World: The Influence of Earth Movement on Human Development. 1935, p. 1.
———————Tasmanian Tribolites. 1937, p. 145.
———————Note on Pleistocene Glaciation—Mt. Field to Strahan. 1938, p. 161.
———————Notes on *Productus subquadratus* Morris and Tasmanian Tribolites. 1938, p. 234.
———————Geology of the Tyenna Valley. 1939, p. 33.
———————Record of *Glossopteris* from Cygnet. 1939, p. 95.
———————Time Scales in Recent Tasmanian Geological History. 1939, p. 135.
———————Tasmanian Physiographical History. 1940, p. 88.
———————Time Scales in the Development of Tasmanian Physiography. 1944, p. 19.
———————Pleistocene Glaciation in Tasmania. 1944, p. 41.
LEWIS, A. N. & MURRAY, J. F. N.—Glacial Features in the D'Entrecasteaux Valley. 1934, p. 87.
LEWIS, A. N. & VOISEY, A. H.—A Record of Volcanic Activity in Tasmania during Triassic Times. 1937, p. 31.
LISMER, A.—Art in a Changing World. 1937, p. 151.
LODDER, M.—List of Tasmanian Shells in the Tasmanian Museum. 1898-1899, p. 129.
———————The Recent Mollusca of Tasmania. 1900-1901, p. 102.
LORD, CLIVE.—Preliminary Note upon the Discovery of Aboriginal Remains at Eaglehawk Neck. 1918, p. 118.
———————The Foundation of National Park. 1918, p. 74.
———————The Early History of Maria Island. 1919, p. 39.
———————The Early History of Bruny Island. 1920, p. 114.
———————Notes on Captain Bligh's Visits to Tasmania in 1788 and 1792. 1922, p. 1. (See pp. 8, 9, 11, 17.)
———————A Note on the Burial Customs of the Tasmanian Aborigines. 1923, p. 45.
———————The Planting of the Dutch Flag in Tasmania in 1642. 1926, p. 25.
———————The South Coast and Port Davey. 1927, p. 1.
———————Notes on the Diary of the Rev. Robert Knopwood, 1805 to 1808. 1927, p. 78.
———————Notes on the Mammals of Tasmania. 1918, p. 16.
———————Notes on the Snakes of Tasmania. 1918, p. 76.
———————Occurrence in Tasmania of *Hydrus platurus* Linn. 1919, p. 22.
———————English Blackbird Nesting in Tasmania. 1919, p. 155 (Discussion).

LORD, CLIVE.—On *Pseudomys higginsi*. 1922, p. 55.
———A List of the Fishes of Tasmania. 1922, p. 60.
———*Vinculum sexfasciatum* Richardson. An Addition to the Fish Fauna of Tasmania. 1923, p. 43.
———Additions to the Fish Fauna of Tasmania. 1924, p. 51.
———Existing Tasmanian Marsupials. 1927, p. 17.
———Occurrence of Sea-Elephant at Dunalley. 1933, p. 91.
LORD, CLIVE & CROWTHER, W. L.—A Descriptive Catalogue of the Osteological Specimens Relating to the Tasmanian Aborigines Contained in the Tasmanian Museum. 1920, p. 137.
———Description of Two Tasmanian Aboriginal Crania. 1921, p. 168.
LORD, CLIVE & SCOTT, H. H.—Studies of Tasmanian Cetacea. Part I. (*Orca gladiator, Pseudorca crassidens, Globicephalus melas*). 1919, p. 1.
———Studies of Tasmanian Cetacea. Part II. (*Ziphius cavirostris*). 1919, p. 23.
———Studies of Tasmanian Cetacea. Part III. (*Tursiops tursio*). 1919, p. 96.
———Studies of Tasmanian Cetacea. Part IV. (*Delphinus delphis*). 1920, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number I. *Nototherium mitchelli*. 1920, p. 13.
———Studies in Tasmanian Mammals, Living and Extinct. Number II. 1920, p. 17.
———Studies in Tasmanian Mammals, Living and Extinct. Number III. *Nototherium mitchelli*. 1920, p. 76.
———Studies in Tasmanian Mammals, Living and Extinct. Number IV. *Nototherium mitchelli*. 1920, p. 97.
———Nototheria and Allied Animals. 1921, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number IV. The Cave Deposits at Mole Creek. 1921, p. 6.
———Studies in Tasmanian Mammals, Living and Extinct. Number V. *Zaglossus harrissoni*. Sp. nov. 1921, p. 13.
———Studies in Tasmanian Mammals, Living and Extinct. Number VI. Cetacean Remains from the Fossil Beds at Wynyard. 1921, p. 180.
———Studies in Tasmanian Mammals, Living and Extinct. Number VII. A Note on the Turbinoid Cells and Allied Data of *Nototherium mitchelli*. 1922, p. 23.
———On the Tasmanian Muridae. 1922, p. 74.
———Studies in Tasmanian Mammals, Living and Extinct. Number VIII. Pleistocene Marsupials from King Island. 1923, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number IX. *Nototheria victoriae* Owen. 1923, p. 4.
———Studies in Tasmanian Mammals, Living and Extinct. Number X. Giant Wallaby, *Macropus anak* Owen. 1923, p. 6.
———Studies in Tasmanian Mammals, Living and Extinct. Number XI. Notes on a Mutilated Femur of *Nototherium*. 1923, p. 56.
———Earbones of the Nototheria and Allied Animals. 1924, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number XII. On Certain Tasmanian Pleistocene Marsupials. 1924, p. 53.
———Tasmanian Giant Marsupials. 1925, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number XIII. The Eared Seals of Tasmania. 1925, p. 75.
———Studies in Tasmanian Mammals, Living and Extinct. Number XIV. The Eared Seals of Tasmania (Part II.). 1925, p. 187.
———Studies in Tasmanian Cetacea. Part V. *Mesoplodon layardi* Gray. 1926, p. 87.
———Studies in Tasmanian Cetacea. Part VI. 1927, p. 156.
———Notes on the Sea Elephant (*Mirounga leoninus*). 1928, p. 93.
LOVERIDGE, A.—Tasmanian Amphibia in the Museum of Comparative Zoology, Cambridge, Massachusetts. 1933, p. 56.
LUCAS, A. H. S.—The Marine Algae of Tasmania. 1928, p. 6.
MACKANESS, G.—Captain William Bligh's Discoveries in Tasmania. 1943, p. 242.
MACKENZIE, W. COLIN.—Australian Fauna and Medical Science. 1925, p. 203.
MACLEAN, W. E.—Hydro-Electric Development in Tasmania. 1935, p. 197.
MACLEOD, W. A.—Notes on the Fossil Wood Found at Cox's Bight. 1898-1899, p. 85.
MACLEOD, W. A. & WHITE, O. E.—On the Occurrence of a New Species of Garnet at Port Cygnet. 1898-1899, p. 74.

MACLEOD, W. A. & WHITE, O. E.—Notes on a Fayalite Basalt from One Tree Point. 1898-1899, p. 77.
———————————Supplementary Notes on Some Antarctic Rocks and Minerals. 1900-1901, p. 38.
MAIDEN, J. H.—Note on a Species of *Eucalyptus* New to Tasmania. 1902, p. 83.
———————————Note on *Eucalyptus linearis* Dehnhardt. 1902, p. 79.
———————————Records of Tasmanian Botanists. 1909, p. 9.
———————————Notes on Some Tasmanian Eucalypts. 1914, p. 20.
———————————Notes on the Tasmanian Eucalypts. 1918, p. 82.
MARTIN, D.—Tasmanian Biological Survey. 1938, p. 236.
———————————The Vegetation of Mt. Wellington, Tasmania—The Plant Communities and a Census of the Plants. 1939, p. 97.
MASTERS, W. E.—Stereoscopic Photography. 1903-1905, p. xlii.
———————————The Semaphore Telegraphic System of Early Van Diemen's Land. 1937, p. 155.
———————————The Early History of Salamanca Place. 1944, p. 128.
MATHER, J. R.—Reservation of Crown Lands at Schouten and Freycinet Peninsula for the Preservation of Native Fauna and Flora. 1903-1905, p. xxxi.
MAULDON, F. R. E.—Economic Science and the Community. 1937, p. 154.
MAULT, A.—Practical Forestry in Tasmania. 1900-1901, p. 127.
MAWSON, DOUGLAS.—Macquarie Island and Its Future. 1922, p. 40.
MAY, W. L.—On Tenison-Woods' Types in the Tasmanian Museum, Hobart. 1902, p. 106.
———————————Additions to the Tasmanian Molluscan Fauna. 1908, p. 53.
———————————Additions to the Catalogue of the Marine Shells of Tasmania. 1910, p. 306.
———————————New Marine Mollusca. 1910, p. 380.
———————————Further Additions to the Tasmanian Mollusca. 1912, p. 41.
———————————Additions to the Tasmanian Marine Mollusca, with Descriptions of New Species. 1915, p. 75.
———————————New Names for Tasmanian *Marginellas*. 1917, p. 104.
———————————Critical Remarks on the Table Cape Fossil Mollusca in the Johnston Collection. 1918, p. 69.
———————————A Revised Census of the Mollusca and Brachiopoda in the Table Cape Beds. 1918, p. 101.
———————————New Species of Tasmanian Mollusca with Critical Remarks on Several Described Species and Additions to the List. 1919, p. 55.
———————————A Revised Census of the Tasmanian Fluviatile Mollusca. 1920, p. 65.
———————————New Species of Fossil Shells from Table Cape. 1921, p. 9.
———————————Mollusca from King Island. 1923, p. 47.
MAY, W. L. & TORR, W. G.—Polyplacophora of Tasmania. 1912, p. 25.
McAULAY, ALEX.—Practical Astronomy in Tasmania. 1902, p. 85 and p. xxx.
———————————Quaternions Applied to Physics in Non-Euclidean Space. 1. The Mathematical Method. 1914, p. 1.
———————————An Experimental Method of Presenting the Principles Determining the General Properties of Optical Gratings. 1923, p. 87.
———————————Researches in Relativity. I. Criticism and Modification of Einstein's Latest Manifold. 1924, Appendix.
———————————Researches in Relativity. II. The Basis of the Physical World as indicated by carrying as far as possible the Tenets of Relativity. 1925, Appendix.
McAULAY, ALEX & MISS HUTCHINSON, N. L.—The Penetrating Radiation in the Atmosphere at Hobart. 1924, p. 123.
McAULAY, A. L.—Evidence for the Existence of a Natural Hybrid between *Eucalyptus globulus* and *E. ovata*. 1937, p. 45.
———————————Production of Saltants of *Chaetomium globosum* by Monochromatic Ultra-Violet Irradiation. 1938, p. 131.
McAULAY, A. L. & CRUICKSHANK, F. D.—The Male Meiotic Cycle in the Genus *Eucalyptus*. 1937, p. 41.
McCLINTON, R. & SCOTT, H. H.—Some Notes upon a Tasmanian Aboriginal Skull. 1925, p. 5.
McCLYMONT, J. R.—Notes on Certain Birds met with by Crozet, one of the very early Navigators. 1903-1905, p. xlviii.
McELROY, MRS. J. A.—Letters of John Martin, the Irish Political Prisoner. 1932, p. 47.
———————————The Times and Some Contemporaries of Lieutenant-Colonel Paterson, Founder of Launceston. 1936, p. 98.
———————————Lt.-Governor Collins and His Royal Marines. 1938, p. 231.
MERCER, J. E.—The Decimal System as Applied to Weights, Measures and Money. 1903-1905, p. xx.
MESTON, A. L.—The Growth of Self-Government in Tasmania. 1927, p. 176.
———————————Notes on a Memorial to Alfred Barrett Biggs, Astronomer. 1933, p. 26.
———————————Ruined Cities of Southern Rhodesia. 1939, p. 142.
———————————Place Names in Tasmania. 1942, p. 167.

MESTON, A. L.—Some New Aspects of Tasman's Visit in 1642. 1943, p. 238.
———————Aboriginal Rock Carvings on the North-West Coast of Tasmania. 1931, p. 12.
———————Aboriginal Rock Carvings in Tasmania (Part II.). 1932, p. 1.
———————Observations on Visits of the Tasmanian Aborigines to the Hunter Islands. 1935, p. 155.
———————The Problem of the Tasmanian Aborigine. 1936, p. 85.
———————The Culture of the Tasmanians. 1940, p. 83.
MONTGOMERY, H. H.—Two Early Journeys Westward—Mr. W. S. Sharland in 1832 and Sir John Franklin in 1842. 1898-1899, p. liii.
———————Notes on Further Regulations in Reference to the Mutton Bird Industry. 1898-1899, p. xv.
———————Note on Museums and Aboriginals. 1900-1901, pp. v, vi.
MOORE, G. E.—Light Railways for Tasmania. 1900-1901, pp. vii, ix.
MOORE-ROBINSON, J.—Tasmanian State Records. 1921, p. 156.
MORTON, ALEX.—Notes on a Visit to West Australia. 1898-1899, p. v.
———————The Bishop of Tasmania. 1900-1901, p. xxxiv.
———————On the Occurrence of a Sea Snake in Tasmanian Waters. 1898-1899, p. iv.
———————Visit to British Columbia to obtain Salmon Ova. 1900-1901, p. xxxvi (Report).
———————Some Account of the Work and Workers of The Tasmanian Society and The Royal Society of Tasmania, from 1840 to 1900. 1900-1901, p. 109.
———————Rainbow Trout from Lake Dulverton. 1903-1905, p. lxi.
———————Notes on Some Tasmanian Aboriginal Waddies. 1905, p. xl.
MORTON, A. & JOHNSTON, R. M.—Notes on King Island. 1906-1907, p. x.
MORTON, MRS. C. E.—Tasmanian Emu. 1907, p. xlvi.
MURRAY, K. L.—Coal and a Coal Mine. 1903-1905, p. liii.
NAGHTEN, R. E.—Tasmania as a Manufacturing Centre. 1902, pp. iv, viii.
NELSON, A.—The Inheritance of Sex in an Abnormal (Carpellodic) Wall-Flower. 1928, p. 119.
NICHOLLS, G. E.—The Phreatoicoidea. 1942, p. 1.
———————The Phreatoicoidea. 1943, p. 1.
NICHOLLS, H. W.—Notes on the Geology of La Perouse. 1898-1899, p. ii.
NICHOLLS, J. W.—Some Aspects of Music. 1941, p. 77.
NICHOLLS, W. H.—A New Tasmanian Terrestrial Orchid. 1932, p. 13.
NICHOLLS, W. H. & OLSEN, A. M.—Additions and Corrections to *Orchidaceae* of Tasmania. 1940, p. 71.
NOETLING, FRITZ.—Notes on the Tasmanian Amorpholithes. 1906-1907, p. 1.
———————Antiquity of the Amorpholithes in Tasmania. 1906-1907, p. 30, p. iii.
———————Notes on a Chipped Boulder found near Kempton. 1908, p. 1.
———————A Native Burial Ground on Charlton Estate near Ross. 1908, p. 36.
———————The Native Quarry at Syndal, near Ross. 1908, p. 44.
———————The Aboriginal Designations for Stone Implements. 1908, p. 60.
———————A Peculiar Group of Tronattas. 1909, p. 1.
———————Red Ochre and its Use by the Aborigines of Tasmania. 1909, p. 30.
———————Rocks Used in the Manufacture of Tronattas. 1909, p. 85.
———————Notes on the Names given to Minerals and Rocks by the Aborigines of Tasmania. 1909, p. 103.
———————Notes on the Glacial Beds at Freestone Bluff, Sandy Cove, near Wynyard. 1909, p. 157.
———————The Antiquity of Man in Tasmania. 1910, p. 231.
———————Comparison of the Tasmanian Tronatta with the Archaeolithic Implements of Europe. 1910, p. 265.
———————The Food of the Tasmanian Aborigines. 1910, p. 279.
———————Notes on the Hunting Sticks (Lughrana), Spears (Perenna) and Baskets (Tughbrana) of the Tasmanian Aborigines. 1911, p. 64.
———————Further Notes on the Habits of the Tasmanian Aborigines. 1911, p. 102.
———————Notes on Duterreau's Reconciliation Picture. 1911, p. 134, p. xxi.
———————Notes on the Marks of Percussion on Siliceous Rocks. 1911, p. 1.
———————The Manufacture of the Tero-Watta. 1911, p. 38.
———————The Occurrence of Gigantic Marsupials in Tasmania. 1911, p. 124.
———————Notes on the Section at One Tree Point near Hobart. 1913, p. 95.
———————Notes on the Publications of the Royal Society of Tasmania. 1910, p. 223.
NOETLING, F., RODWAY, L. & FLYNN, T. T.—Land Connections with Antarctica. 1914, p. 88.
NORMAN, JAMES,—Aborigines of Tasmania—The Norman Vocabulary. 1910, p. 333.
NOWELL, E. C.—On the Conservation and Culture of Trees. 1898-1899, p. xliv.

NYE, P. B.—Lower Tertiary (Miocene) Marine Sedimentary Rocks of the Far North-Western Districts of Tasmania. 1940, p. 11.
————————Discussion on 'Note on the Isostatic Background of Tasmanian Physiography' by A. N. Lewis, 1927, p. 66.
OLSEN, A. M.—New Tasmanian Orchids. 1940, p. 83.
OLSEN, A. M. & NICHOLLS, W. H.—Additions and Corrections to *Orchidaceae* of Tasmania. 1940, p. 71.
O'MAY, H.—The Shipbuilding and Seafaring Pioneers of Tasmania. 1940, p. 79.
ORCHARD, W. A.—The Evolution of Keyboard Instruments and Their Music. 1936, p. 100.
————————Shakespeare and Music. 1938, p. 237.
PARKER, H. T.—The Examiners on the Defensive. 1936, p. 102.
————————Can Animals Think? 1940, p. 85.
————————The Evolution of an Environment. 1943, p. 246.
PEARSON, JOSEPH.—The Whales and Dolphins of Tasmania: Part I.—External Characters and Habits. 1935, p. 163.
————————Heredity. 1935, p. 198 (Abstract of Lecture).
————————The Tasmanian Brush Opossum: Its Distribution and Colour Variations. 1937, p. 21.
————————The Furniture of the 17th and 18th Centuries. 1937, p. 149.
————————Relationships of the Tasmanian Canoe Raft. 1938, p. 221.
————————Inheritance of Visual Defects. 1939, p. 138.
————————An Astraeid Coral from Dover. 1939, p. 136.
————————Concealing Coloration and Camouflage. 1943, p. 240.
————————The Geographical Distribution of Animals. 1943, p. 244.
————————Notes on the Blood System of the Marsupialia. 1939, p. 77.
————————The Female Urogenital System of the Marsupialia with Special Reference to the Vaginal Complex. 1944, p. 71.
————————Centenary of the Royal Society of Tasmania. 1943, p. 223.
PEARSON, W. H.—*Jungermannia stygia*. 1921, p. 166.
PETTERD, W. F.—Description of a Meteorite from Castray River, Tasmania. 1900-1901, p. 48, p. xiv.
————————On Some Land and Aquatic Shells from Maria Island. 1900-1901, p. 1.
————————The Microscopic Structure of some Tasmanian Rocks. 1900-1901, p. 53.
————————The Minerals of Tasmania. 1900-1901, p. 75.
————————Notes on Unrecorded and Other Minerals in Tasmania. 1902, p. 18, p. xxiii.
————————Notes on Tasmanian Minerals. 1903-1905, pp. xviii and 62.
————————Notes on Tasmanian Minerals. 1903-1905, p. xlvi.
————————Dundasite. 1903-1905, p. lviii.
————————Notes on Some Additional Minerals Recently Determined, with New Localities for Species Known to Occur in Tasmania. 1903-1905, p. 75.
————————The Minerals of Tasmania. 1910, p. 1.
PETTERD, W. F. & TWELVETREES, W. H.—Supplementary Note on Limurite in Tasmania. 1898-1899, pp. 1 and 56.
————————On Hauyne-trachyte and Allied Rocks in the Districts of Port Cygnet and Oyster Cove. 1898-1899, p. 3, p. xxvii.
————————Notes on Humeri of a Tasmanian Labyrinthodont. 1898-1899, p. 27.
————————Felsites and Associated Rocks of Mt. Read and Vicinity. 1898-1899, p. 33.
————————On the Mesozoic Dolerite and Diabase in Tasmania. 1898-1899, p. 47, p. xlvi.
————————Nepheline and Melilite Rocks from the Shannon Tier. 1898-1899, p. 60.
————————On the Genus *Kraussina* in Tasmania. 1898-1899, p. 88.
PHILP, J. E.—Some Tasmanian Aboriginal Stone Axes on Tasman Is. 1906, p. xi.
PIESSE, E. L.—The Theory of the Quota in Proportional Representation—I. 1912, p. 49.
————————The Theory of the Quota in Proportional Representation—II. 1913, p. 15.
————————Bibliography of Proportional Representation. 1913, p. 39.
————————The Foundation and Early Work of the Royal Society. 1913, p. 117.
PIESSE, E. L. & GIBLIN, L. F.—The Ben Lomond Range—Notes on the Height of Legge Tor. 1906-1907, p. xxxvii.
PIESSE, E. L., GIBLIN, L. F. & HUTCHINSON, H. R.—The Height of Ben Lomond 1913, p. 5.
————————Note on Strzelecki's Determination of Heights in Tasmania. 1913, p. 116.
PLOMLEY, N. J. B.—Notes on the Systematics of Two Species of *Heterodoxus* (Mallophaga, Boopidae). 1939, p. 19.
PODMORE, S. M. M.—Species and Hybridisation. 1903-1905, p. xlix.

RAIT, B. W.—A Century-old Dictator. 1940, p. 81.
RALPH, B. J., KURTH, E. E. & ISRAEL, G. C.—Some Avenues for Chemical Research in Tasmania. 1944, p. 123.
REES, H. V.—Pasteurization. 1943, p. 246
REID, A McI.—The Oil Shales of Tasmania. 1926, p. 42.
REYNOLDS, JOHN.—Notes on the Currency of Early Tasmania. 1925, p. 209.
————————Notes on the Constitutional Separation of Tasmania from New South Wales 1926, p. 35.
————————In Memoriam—Clive Errol Lord. 1933, p. 98.
RICHARDSON, A. E. V.—Scientific Research in Relation to Industry. 1940, p. 78.
RITZ, H. B.—Evolution in Language. 1903-1905, p. lix.
————————On Dr. Noetling's Conclusions Respecting the Aboriginal Designations for Stone Implements. 1908, p. 68.
————————An Introduction to the Study of the Aboriginal Speech of Tasmania. 1908, p. 73.
————————The Speech of the Tasmanian Aborigines. 1909, p. 44.
————————Notes on the Norman Vocabulary. 1910, p. 343.
————————Notes on the List of Native Words of the Oyster Bay Tribe, presented by J. W. Beattie. 1913, p. 82.
ROBERTS, E. J.—The Germ as a Friend in Therapeutics (The Opsonic Index). 1906-1907, p. xli.
ROBIN, P. A.—Additions to the Catalogue of the Tasmanian Mollusca. 1929, p. 33.
RODWAY, L.—Forestry for Tasmania. 1898-1899, p. liii.
————————Additions to the Fungus Flora of Tasmania. 1898-1899, p. 97.
————————On a New *Cordyceps*. 1898-1899, p. 100.
————————Botanical Notes. 1898-1899, p. li, p. 103.
————————Botany. 1900-1901, p. 85.
————————Additions to Tasmanian Flora. 1900-1901, p. 117.
————————Botanical Descriptions of Eucalypti. 1902, p. 72.
————————Tasmanian Onagraceae. 1909, p. 39.
————————Note on *Brachycome melanocarpa*. 1909, p. 123.
————————Notes on *Eucalyptus risdoni*. 1910, p. 367.
————————*Geoglossum hirsutum*. 1911, p. xx.
————————The Hymenogastraceae of Tasmania. 1911, p. 21.
————————Notes on *Treubia insignis*. 1911, p. 62.
————————Leaf Impressions. 1912, p xx.
————————Tasmanian Mosses. Part I. 1912, p. 3.
————————Tasmanian Mosses. Parts II. and III. 1912, p. 87.
————————Tasmanian Bryophyta. Part III. 1913, p. 177.
————————Botanic Evidence in favour of land connection between Fuegi and Tasmania during the present Floristic Period. 1914, p. 32.
————————*Pseudopeziza casuarinae*. 1915, p. 74.
————————Additions to the Tasmanian Flora. 1915, p. 104.
————————Notes on a Graft-hybrid. 1915, p. 108.
————————Additions to the Bryophyte Flora. 1916, p. 44.
————————Tasmanian Bryophyta. 1916, p. 51.
————————Geoffrey Watkins Smith. 1916, p. 286.
————————Tasmanian Eucalypts. 1917, p. 10.
————————Botanical Notes. 1917, p. 105.
————————Notes and Additions to the Fungus Flora of Tasmania. 1919, p. 110.
————————Additions to the Fungus Flora of Tasmania. Part III. 1920, p. 153.
————————On *Polyporus pulcherrimus*. 1921, p. 176.
————————Some Additions to our Recorded Flowering Plants. 1922, p. 77.
————————Description of Two Underground Fungi. 1923, p. 108.
————————Tasmanian Hymenogastraceae. 1923, p. 151.
————————Two Interesting Fungi. 1924, p. 8.
————————Tasmanian Discomycetes. 1924, p. 90.
————————On the Occurrence of *Wolffia arrhiza* in Tasmania. 1925, p. 11.
————————Notes on some rare and interesting Cryptogams. 1925, p. 167.
————————A Note on *Eucalyptus johnstoni*. 1926, p. 118.
————————Note on *Gautieria* in Tasmania. 1928, p. 72.
RODWAY, L. & CLELAND, J. B.—Notes on the genus *Poria*. 1928, p. 31.
————————————Notes on the genus *Poria*, No. 2. 1928, p. 73.
————————————Notes on the genus *Poria*. No. 3. 1929, p. 7.
RODWAY, L. & DIXON, H. N.—On *Phascus tasmanicum*. 1922, p. 25.
RODWAY, L., FLYNN, T. T. & NOETLING, F.—Land connections with Antarctica. 1914, p. 88.
RODWAY, L. & WEYMOUTH, W. A.—Bryophyte Notes. 1921, p. 173.

ROGERS, R. S.—A Contribution to the Orchidology of Tasmania. 1931, p. 105.
SCOTT, E. O. G.—Preliminary Note on the Supposed Aboriginal Rock Carvings at Mersey Bluff, Devonport. 1931, p. 112.
———On the Occurrence in Tasmania of *Hydrophis ornatus*, variety *ocellatus*, with a Note on *Pelamis platurus* (=*Hydrus platurus*). 1931, p. 111.
———Observations on Some Tasmanian Fishes, with Descriptions of New Species. 1933, p. 31.
———Observations on Some Tasmanian Fishes. Part II. 1934, p. 63.
———Observations on Some Tasmanian Fishes. Part III. 1935, p. 113.
———Observations on Some Tasmanian Fishes. Part IV. 1938, p. 139.
———Observations on Some Tasmanian Fishes. Part V. 1941, p. 45.
———Notes on the Gobies Recorded from Tasmania with Descriptions of a New Genus. 1934, p. 47.
———Note on the So-Called Minute Snake of Tasmania. 1933, p. 54.
———On a New genus of Fishes of the Family Galaxiidae. 1934, p. 41.
———Some Aspects of the Study of Tasmanian Fishes. 1935, p. 197 (Abstract of Lecture).
———Observations on Fishes of the Family Galaxiidae. Part I. 1935, p. 85.
———Observations on Fishes of the Family Galaxiidae. Part II. 1937, p. 111.
———Observations on Fishes of the Family Galaxiidae. Part III. 1940, p. 55.
———Fish and Fish-like Animals. 1940, p. 81.
———Recent Researches on Fishes. 1940, p. 86.
———A Naturalist in Tasmania. 1941, p. 86.
———Modern Museum Developments. 1939, p. 142.
SCOTT, E. O. G. & HICKMAN, V. V.—The Occurrence of the Freshwater Polyzoan *Plumatella repens* (Van Beneden) in Tasmania. 1932, p. 7.
SCOTT, H. H.—Notes on a Fossil Whale from Wynyard. 1913, p. 167.
———A Note on the *Palorchestes* as a Tasmanian Pleistocene Genus. 1915, p. 100.
———A Note on the King Island Emu. 1923, p. 103.
———The Extinct Tasmanian Emu. 1931, p. 108.
———Notes on a Fossil Pine from the Permo-Carboniferous (*Dadoxylon penmani* Sp. nov.). 1933, p. 17.
———Tasmanian Cycadophyta. Part I. 1930, p. 90.
———Tasmanian Cycadophyta. Part II. 1933, p. 65.
———Augustus Simson—Obituary. 1918, p. 143.
SCOTT, H. H. & LORD, CLIVE.—Studies of Tasmanian Cetacea. Part I. (*Orca gladiator, Pseudorca crassidens, Globicephalus melas*). 1919, p. 1.
———Studies of Tasmanian Cetacea. Part II. (*Ziphius cavirostris*). 1919, p. 23.
———Studies of Tasmanian Cetacea. Part III. (*Tursiops tursio*). 1919, p. 96.
———Studies of Tasmanian Cetacea. Part IV. (*Delphinus delphis*). 1920, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number I. (*Nototherium mitchelli.*) 1920, p. 13.
———Studies in Tasmanian Mammals, Living and Extinct. Number II. 1920, p. 17.
———Studies in Tasmanian Mammals, Living and Extinct. Number III. *Nototherium mitchelli.* 1920, pp. 13, 17 and 76.
———Studies in Tasmanian Mammals, Living and Extinct. Number IV. *Nototherium mitchelli.* 1920, p. 97.
———Nototheria and Allied Animals. 1921, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number IV. The Cave Deposits at Mole Creek. 1921, p. 6.
———Studies in Tasmanian Mammals, Living and Extinct. Number V. *Zaglossus harrissoni.* Sp. nov. 1921, p. 13.
———Studies in Tasmanian Mammals, Living and Extinct. Number VI. Cetacean Remains from the Fossil Beds at Wynyard. 1921, p. 180.
———Studies in Tasmanian Mammals. Living and Extinct. Number VII. A Note on the Turbinoid Cells and Allied Data of *Nototherium mitchelli.* 1922, p. 23.
———On the Tasmanian Muridae. 1922, p. 74.
———Studies in Tasmanian Mammals, Living and Extinct. Number VIII. Pleistocene Marsupials from King Island. 1923, p. 1.
———Studies in Tasmanian Mammals, Living and Extinct. Number IX. *Nototheria victoriae* Owen. 1923, p. 4.
———Studies in Tasmanian Mammals, Living and Extinct. Number X. Giant Wallaby, *Macropus anak* Owen. 1923, p. 6.

SCOTT, H. H. & LORD, CLIVE.—Studies in Tasmanian Mammals, Living and Extinct. Number XI. Note on a Mutilated Femur of *Nototherium*. 1923, p. 56.
————————————Earbones of the Nototheria and Allied Animals. 1924, p. 1.
————————————Studies in Tasmanian Mammals, Living and Extinct. Number XII. On Certain Tasmanian Pleistocene Marsupials. 1924, p. 53.
————————————Tasmanian Giant Marsupials. 1925, p. 1.
————————————Studies in Tasmanian Mammals, Living and Extinct. Number XIII. The Eared Seals of Tasmania. 1925, p. 75.
————————————Studies in Tasmanian Mammals, Living and Extinct. Number XIV. The Eared Seals of Tasmania (Part II.). 1925, p. 187.
————————————Studies in Tasmanian Cetacea. Part V. *Mesoplodon layardi* Gray. 1926, p. 87.
————————————Studies in Tasmanian Cetacea. Part VI. 1927, p. 156.
————————————Notes on the Sea Elephant (*Mirounga leoninus*). 1928, p. 93.
SCOTT, H. H. & McCLINTON, R.—Some Notes upon a Tasmanian Aboriginal Skull. 1925, p. 5.
SCOTT, R. A.—Tasmanian Potato Problems. 1942, p. 170.
SELF, THOS.—Telegraphy Without Wires. 1898-1899, p. vii.
SHARLAND, M. S. R.—The Life of the Lyre Bird. 1941, p. 79.
SHIRLEY, JOHN.—Mosses Common to Tasmania and Queensland. 1917, p. 6.
————————————The Thallus of the Genus *Parmelia*. 1918, p. 53.
SHUFELDT, R. W.—Skeletons of the Monotremes in the Collections of the Army Medical Museum at Wellington. 1921, p. 99.
SINGH, T. C. N.—Notes on the Fossil Spores in an Oil-Shale from Tasmania. 1931, p. 32.
SMITH, GERARD.—The Biological Ancestry of Some Human Diseases. 1906-1907, p. vii.
SMITH, H. G. & BAKER, R. T.—A Research on the Eucalypts of Tasmania and Their Essential Oils. 1912, p. 139.
SMITHIES, F.—Frenchman's Cap. 1941, p. 84.
————————————The Overland Journey of Sir John and Lady Franklin to Macquarie Harbour in 1842. 1943, p. 245.
SOMERVILLE, J.—The Royal Society of Tasmania, 1843-1943. 1943, p. 199.
————————————Government Houses in Hobart Town. 1944, p. 109.
SPENDER, H. J.—Electricity and Matter. 1906-1907, p. xlvi.
SPROTT, G.—Cause and Prevention of Typhoid Fever, with Special reference to the proposed Metropolitan Drainage Scheme of Hobart. 1898-1899, p. ix.
STEANE, S. W.—Forest Problems. 1937, p. 153.
STEPHENS, C. G.—The Tree and the Soil. 1937, p. 153.
STEPHENS, C. G. & CANE, R. F.—The Soils and General Ecology of the North-East Coastal Regions of Tasmania. 1938, p. 201.
STEPHENS, T.—Notes on Coral Reefs with Special Reference to the Funafuti Borings. 1898-1899, p. 92.
————————————A Further Note on Obsidian Buttons. 1900-1901, p. 42.
————————————Notes on the Occurrence of a Fossil Tree Embedded in Drift on the North-West Coast of Tasmania. 1909, p. 82.
————————————Geological Notes on the Country Traversed by the Derwent Valley Railway Extension. 1909, p. 170.
————————————Notes on Mineral Springs of North-West Tasmania. 1912, p. 85.
————————————Fossil Bone from near Circular Head. 1911, p. xix.
STRICKLAND, G.—Some Developments in 1905-6 Conductive to Tasmania's Progress. 1906-1907, p. i.
————————————Duties of Leisure. 1905, p. xli.
————————————Inventions and Discoveries for the Year. 1906-1907, p. xxviii.
————————————Review of Scientific Progress, 1907-8. 1909, p. 1.
SUTTON, C. S.—A Sketch of the Vegetation of the Cradle Mountain, Tasmania, and a Census of its Plants. 1928, p. 132.
TARGETT, C. B.—Reservoirs. 1900-1901, p. x.
————————————On the Advantages of Forest Conservation. 1902, p. xiii.
TAYLOR, GRIFFITH.—Some Geographical Notes on a Model of National Park at Mt. Field. 1921, p. 188.
THOMAS, D. E.—The Geological Work of Dr. A. N. Lewis. 1943, p. 251.
————————————A Critical Review of Tasmanian Graptolite Records. 1944, p. 9.
THOMAS, D. E. & HENDERSON, Q. J.—Some Fossils from the Dundas Series, Dundas. 1944, p. 1.
THOMPSON, E. H. Rev.—Agronomy in Relation to Science. 1903-1905, p. 34.
THOMPSON, G. B.—The Distribution of *Heterodoxus spiniger* (Enderlein). 1939, p. 27.
THOMSON, G. M.—Note on *Hippomedon Kergueleni* Miers, an Amphipod Received from Cape Adare, South Victoria Land. 1900-1901, p. 3.
TILLYARD, R. J.—The Biological Control of Noxious Weeds. 1929, p. 51.
————————————The Evolution of the Class Insecta. 1930, p. 1.

TILLYARD, R. J.—The Trout-Food Insects of Tasmania. Part I. A Study of the Genotype of the Mayfly Genus *Atalophlebia* and Its Life History. 1933, p. 1.
———————The Trout-Food Insects of Tasmania. Part II. A Monograph of the Mayflies of Tasmania. 1935, p. 23.
TINDALE, N. B.—A Tasmanian Stone Implement made from Bottle Glass. 1941, p. 1.
TONNOIR, A. L.—Australian Dixidae (Diptera). 1923, p. 58.
TORR, W. G.—A New Tasmanian Chiton. 1912, p. 1.
TORR, W. G. & MAY, W. L.—Polyplacophora of Tasmania. 1912, p. 25.
TRIEBEL, L. A.—Pasteur—A Play in Five Acts—by Sacha Guitry. 1941, p. 79.
TURNER, A. JEFFERIS.—New and Little-Known Tasmanian Lepidoptera. 1925, p. 81.
———————A Revision of the Lepidoptera of Tasmania. 1925, p. 118.
———————New and Little-Known Tasmanian Lepidoptera. Part II. 1926, p. 119.
———————A Revision of the Lepidoptera of Tasmania. Part II. 1927, p. 29.
———————A Second Revision of the Lepidoptera of Tasmania. 1938, p. 57.
TWEEDIE, M. W. F.—The Grapsid and Ocypodid Crabs of Tasmania. 1941, p. 13.
TWELVETREES, W. H.—Trachydolerite in Tasmania. 1902, p. 133.
———————Outlines of the Geology of Tasmania. 1900-1901, p. 58.
———————A Geological Excursion to Port Cygnet. 1903-1905, pp. iv and 41.
———————Description and Analysis of a New Species of Mineral, Petterdite, a new Oxychloride of Lead. 1900-1901, p. 51.
———————Rocks at Port Cygnet. 1903, p. xviii.
———————Records of Obsidianites or Obsidian Buttons found in Tasmania. 1903-1905, p. lvii.
———————Note on 'Jacupirangite' in Tasmania. 1903-1905, p. 73.
———————Discovery of an Aboriginal Chipped Flake in Deep Ground near Gladstone. 1916, p. 48.
TWELVETREES, W. H. & PETTERD, W. F.—Supplementary Note on Limurite in Tasmania. 1898-1899, pp. 1 and 56.
———————On Hauyne-Trachyte and Allied Rocks in the Districts of Port Cygnet and Oyster Cove. 1898-1899, p. 3, p. xxvii.
———————Felsites and Associated Rocks of Mt. Read and Vicinity. 1898-1899, p. 33.
———————Nepheline and Melilite Rocks from the Shannon Tier. 1898-1899, p. 60.
———————On the Mesozoic Dolerite and Diabase in Tasmania. 1898-1899, p. 47, p. lxvi.
———————On the Genus *Kraussina* in Tasmania. 1898-1899, p. 88.
———————Note on the Humeri of the Tasmanian Labyrinthodonts. 1898-1899, pp. ii and 27.
UNWIN, E. E.—On the Structure of the Respiratory Organs of the Terrestrial Isopoda. 1931, p. 37.
———————The Breathing of Animals. 1935, p. 195.
———————The Voices of Animals. 1942, p. 164.
———————Biology and Education. 1943, p. 242.
VALENTINE, J. D.—Flax. 1940, p. 87.
VOISEY, A. H. & LEWIS, A. N.—A Record of Volcanic Activity in Tasmania during Triassic Times. 1937, p. 31.
WAKEFIELD, F. W.—A Biometric Study of the Conidia of *Macrosporium* and *Alternaria*. 1922, p. 27.
WALKER, E. R.—Economic Background of the European Situation. 1939, p. 137.
WALKER, J. B.—The Cartography of Terra Australis and New Holland. 1898-1899, p. xli.
———————The Tasmanian Aborigines. 1898-1899, p. 65.
WALKOM, A. B.—Notes on Some Tasmanian Mesozoic Plants. Part I. 1924, p. 73.
———————Notes on Some Tasmanian Mesozoic Plants. Part II. 1925, p. 63.
WALLER, G. A. & HOGG, E. G.—The Tourmaline-bearing Rocks of the Heemskirk District. 1902, p. 143.
WARD, L. KEITH.—A Contribution to the Geology of Tasmania—the Pre-Cambrian Rocks. 1909, p. 124.
WARD, W. F.—Collisions at Sea. How they are Caused. 1906-1907, p. xliv.
WAYN, A. L.—Sir George Arthur, Lt.-Governor of Van Diemen's Land 1824-1836. 1941, p. 80.
WEDGWOOD, C. H.—The Economic Life of a New Guinea People. 1940, p. 82.
WEYMOUTH, W. A.—Some Additions to the Bryological Flora of Tasmania. 1902, p. 11.
WEYMOUTH, W. A. & RODWAY, L.—Bryophyte Notes. 1921, p. 173.
WHITE, A.—New Australian Asilidae (Diptera). 1913, p. 264.
———————The Diptera-Brachycera of Tasmania. Part I. Families Leptidae, Stratiomyidae, Nemestrinidae and Cyrtidae. 1914, p. 35.
———————The Diptera-Brachycera of Tasmania. Part II. 1915, p. 1.
———————The Diptera-Brachycera of Tasmania. Part III. 1916, p. 148.

WHITE, A.—New Australian Asilidae. 1917, p. 72.
WHITE, N. H.—The Viruses of Plants. 1944, p. 126.
WHITE, O. E. & MACLEOD, W. A.—On the Occurrence of a New Species of Garnet at Port Cygnet. 1898-1899, p. 74.
———————————————Notes on a Fayalite Basalt from One Tree Point. 1898-1899. p. 75.
———————————————Supplementary Notes on Some Antarctic Rocks and Minerals. 1900-1901, p. 38.
WHITEHOUSE, F. W.—Experiences of a Geologist in the Field. 1939, p. 134.
WHITLEY, G. P.—R. M. Johnston's Memoranda Relating to the Fishes of Tasmania. 1928, p. 44.
———————————Sharks. 1942, p. 166.
WILKINSON, E. H.—Sewage Purification and Disposal. 1902, pp. xxxiii, 100.
WOMERSLEY, H.—Tasmanian Collembola of the Family Sminthuridae (Globular Springtails). 1931. p. 1.

The Royal Society of Tasmania

1945

Patron:

His Majesty the King.

President:

His Excellency Sir Ernest Clark, G.C.M.G., K.C.B., C.B.E.

Vice-Presidents:

V. V. Hickman, B.A., D.Sc., 1945-46.

H. Allport, LL.B., 1945-47.

Council:

L. Cerutty, B.A., Dip.Ed., 1945, 1946, 1947.

W. L. Crowther, D.S.O., M.B., 1945, 1946, 1947.

R. G. Brett, B.Sc., 1945, 1946.

A. L. Meston, M.A., 1945, 1946.

G. C. Israel, M.Sc., A.I.C., A.A.C.I., 1945.

J. B. Hamilton, M.B., Ch.M., F.R.A.C.S., 1945.

Hon. Secretary and Librarian:

Joseph Pearson, D.Sc. (Manchester), D.Sc. (Liverpool), F.R.S.E., F.L.S.

Assistant Hon. Secretary:

D. C. Pearse, M.C.

Hon. Treasurer:

S. Angel.

Hon. Auditor:

H. J. Exley, M.A.

Hon. Editors of the Papers and Proceedings:

Joseph Pearson.

D. C. Pearse.

Standing Committee:

W. L. Crowther, H. Allport, V. V. Hickman, J. Pearson.

Annual Report, 1945

The Annual Meeting was held in the Society's Room, Tasmanian Museum and Art Gallery, Hobart, on the 19th March, 1945.

The following Office-bearers were elected:—

Vice-President: Under the Society's Rules, Dr. W. L. Crowther retired from the office of Vice-President, and Mr. H. Allport was appointed in his place (retiring 1947).

Hon. Secretary and Librarian: Dr. Joseph Pearson.

Hon. Assistant Secretary: Mr. D. C. Pearse.

Hon. Treasurer: Mr. S. Angel.

Hon. Auditor: Mr. E. J. Exley.

Council: Under the Rules, Mr. N. P. Booth and Dr. H. D. Gordon retired from the Council, and the following members were elected to the Council in their place:—

Dr. W. L. Crowther (retiring 1948).

Mr. L. Cerutty (retiring 1948).

Also one member was required to take the place of Mr. Henry Allport, who was elected Vice-President, and Mr. G. C. Israel was elected for one year.

The Council made the following appointments at its first meeting:—

Assistant Librarian: Miss H. Taylor.

Standing Committee: Dr. W. L. Crowther, Mr. H. Allport, Professor V. V. Hickman, and the Secretary.

The Council elected the following two members of the Society to serve on the Board of Trustees of the Tasmanian Museum and Botanical Gardens:—Professor V. V. Hickman and Mr. H. Allport. Later in the year Mr. Allport found it necessary to resign from this position, and Dr. H. D. Gordon was appointed in his place.

Nine meetings were held during the year (see Proceedings for abstracts of papers). In addition, scientific papers were submitted for publication and have been printed in the present volume.

Library

During the year 303 volumes were added to the Library in addition to a number of reports and pamphlets from British and foreign institutions and learned societies. The number of institutions on the Exchange List for the year was 286. With the termination of the war the usual exchange with overseas institutions has been resumed. The Library now consists of 21,059 volumes.

An amount of £54 8s. 1d. was spent on books during the year, and the account allocated as follows:—

	£	s.	d.
General Fund	27	16	1
R. M. Johnston Fund	17	5	7
Morton Allport Memorial Fund	3	5	0
Clive Lord Memorial Fund	5	2	6
A. H. Clarke Bequest	0	18	11

Membership

The Society consists of the following members:—

	1944.			1945.
Honorary Members	2			2
Corresponding Members	2			2
Ordinary Members	266 (one class)	Class A	164	
		Class B	100	
		Unclassified	14	
				278
Life Members	6			9
Associate Members	7			14
Total	283			305

During the year 19 names were removed from the List of Members owing to deaths, resignations, etc., and 41 new members were elected, three of these being Life Members, 28 Ordinary Members, and 10 Associate Members.

Deaths

The Council regrets having to record the deaths of the following members during the year:—Mr. Arthur Butler (joined 1925), Mr. T. W. H. Clarke (1918), Mr. W. E. Hitchcock (1914), Mr. E. D. F. Kemp (1930), Mr. H. J. Wise (1901).

Prior to his death Mr. Clarke made a bequest of £500 to the Trustees of the Tasmanian Museum to be spent expressly on the Zoological Section.

Franklin Centenary

On the 18th May, 1945, which was the centenary of the departure of Sir John Franklin on his last expedition to the Arctic in His Majesty's ships 'Erebus' and 'Terror', the Society laid a laurel wreath on the Franklin statue in Franklin Square. Members of the Shiplovers' Society, the Regatta Association, and the Historical Society also laid wreaths on the Franklin statue.

Farewell to His Excellency Sir Ernest Clark

At the June meeting of the Society an opportunity was given to members of the Royal Society of Tasmania and the friends of the Tasmanian Museum to bid farewell to His Excellency the Governor, Sir Ernest Clark, prior to his departure from Tasmania. (See page 164.)

The Council wishes to record their gratitude for the faithful service which His Excellency rendered to the Society during his twelve years' tenure of the office of President of the Society. During that period he attended about 70 meetings and on most occasions took an active part in the discussions which followed the papers.

New Book-plate for Library

During the year the Council decided to have a book-plate bearing the badge of the Society to be placed in the Society's books other than those which had been purchased from the special memorial funds.

Preservation of Ancient Buildings and Scenic Reserves

During the year the Lord Mayor of Hobart called a public meeting of citizens in order to discuss the question of the preservation of ancient buildings and scenic reserves. A committee was duly appointed to submit proposals to the Minister for

Lands and Works. After receiving the deputation the Minister decided to obtain the advice of a small temporary committee consisting of representatives of the Royal Society of Tasmania and other societies. Dr. C. N. Atkins was appointed to represent the Society on this advisory council. As a result of the deliberation of this temporary committee, the Minister instructed the Scenery Preservation Board to draw up a list of scenic reserves and buildings which should be preserved, and later the Scenery Preservation Board solicited the help of the Royal Society of Tasmania in this matter.

Charges for Early Copies of the Papers and Proceedings

During the year the Council discussed the question of the charges for early copies of the Society's Papers and Proceedings, and decided that a flat rate of £1 should be paid for any back numbers of the Papers and Proceedings prior to the year 1900. When only six copies or less of a particular issue remained, these would not be sold.

Arrival of His Excellency Admiral Sir Hugh Binney (Governor of Tasmania)

At the levee held at the Town Hall, Hobart, on December 24th, 1945, the Royal Society of Tasmania presented an address of welcome to the new governor.

Printing of Papers and Proceedings

The Government has decided to increase the printing vote to £200 and the Council wishes to record its appreciation of this generous assistance.

The Royal Society of Tasmania.

Statement of Receipts and Payments for Year ended 31st December, 1945.

Receipts.	£	s.	d.	Payments.	£	s.	d.
Balance from last Account	1	4	4	Salaries	124	2	4
Subscriptions (not including three Life Memberships)	354	2	0	Petty cash	35	0	0
Rents, sales, etc.	34	19	0	Library	54	8	1
				Stationery	16	16	4
				Miscellaneous	45	13	2
				Fuel and light	11	13	4
				Transferred to Reserve Fund	50	0	0
				Insurance	10	13	10
				Northern Branch	10	13	0
				Papers and Proceedings, postage	3	16	0
					362	16	1
				Balance to next Account	27	9	5
	£390	5	6		£390	5	6

S. Angel, Hon. Treasurer.

H. J. Exley, Hon. Auditor.

V. V. Hickman, Vice-President.

Joseph Pearson, Hon. Secretary.

Balances in Royal Society Funds, 1945.

	£	s.	d.
Reserve Fund	217	14	4
Life Membership Fees	91	2	6
Clive Lord Memorial Fund	41	14	9
R. M. Johnston Memorial Fund	18	6	3
Morton Allport Memorial Fund	3	15	0
A. H. Clarke Bequest	1	5	3

Abstracts of Proceedings

19TH MARCH, 1945

Annual Meeting

The Annual Meeting was held in the Society's Room, Tasmanian Museum, Dr. W. L. Crowther, Vice-President, presided.

The following were elected Office-bearers and members of the Council for 1945:—Mr. H. Allport was elected Vice-President in the place of Dr. W. L. Crowther, who retired under Rule 12; Dr. W. L. Crowther and Mr. L. Cerutty were elected in the places of Mr. N. P. Booth and Dr. H. D. Gordon, who retired under Rule 21; Mr. G. C. Israel was elected to take the place of Mr. H. Allport, who was elected Vice-President; Hon. Treasurer, Mr. S. Angel; Hon. Auditor, Mr. H. J. Exley; Hon. Secretary, Dr. J. Pearson; Assistant Hon. Secretary, Mr. D. C. Pearse.

The following were elected members of the Society:—Miss P. Berriman, Miss P. Butcher, Miss J. Stockdale, Mr. N. L. Burrows, Mr. L. W. Miller.

Professor V. V. Hickman delivered an illustrated lecture entitled 'The Enemies of Spiders', of which the following is an abstract:—

> Spiders have many enemies. They are devoured by birds, frogs, lizards, and various mammals. In the Middle Ages spiders were sometimes eaten by man himself in the belief that they were of medicinal value. At the present day certain native races, e.g., the Laos of Siam and the Lepchas of India, make use of spiders as food.
>
> In Britain investigations of the stomach-contents of various birds have been made and it has been found that a single starling consumes about 685 spiders per annum, while the total starling population probably devours more than 10,000 million per annum. It is among invertebrate animals, however, that we find the most important enemies of spiders. Thread-worms belonging to the genera *Mermis* and *Gordius* are known to parasitise certain spiders. The eggs of spiders are frequently devoured by the larvae of such insects as the Ichneumonidae, Mantispidae, and Chloropidae. Certain minute Hymenoptera belonging to the Proctotrypidae lay their eggs inside spiders' eggs, which are thus prevented from developing.
>
> Fossorial wasps belonging to the Pompilidae are among the best known enemies of spiders. The female Pompilid usually selects a large Lycosid or wolf-spider as her victim. The spider is caught and paralysed with a sting. A burrow or nest is made in the ground and the spider dragged into it. The wasp then lays an egg on the spiders abdomen. Finally the nest is closed by filling it with loose earth. Other wasps belonging to Trypoxylidae and Sphecidae make clay or mud nests, which they store with spiders.
>
> Many of the Argiopidae or orb-weaving spiders are attacked in their webs by ichneumons belonging to the sub-family Pimplinae. The ichneumon places an egg on the spider's body and when the egg hatches, the ichneumon larva slowly devours the living spider.
>
> The larvae of some of the flies belonging to the family Cyrtidae bore into the body of certain spiders and live as endoparasites, feeding on the soft tissues of the abdomen and eventually killing the host.
>
> Spiders are largely cannibalistic in their habits and it is not unlikely that more spiders are killed by their own kind than by any other group of animals.

9TH APRIL, 1945

A meeting was held in the Society's Room. The President, His Excellency the Governor, presided.

The following were elected members of the Society:—Ordinary Members: Miss M. Bethune, Mr. H. S. Barnett, Dr. S. W. Carey, Mr. L. E. Couchman, M. J. L. Hull, Mr. F. Usher, Mr. P. H. Waterworth; Associate Members: Miss B. T. Luck,

Mr. T. Cunningham, Mr. C. Elliott, Mr. D. I. Frost, Mr. B. A. B. Edwards, Mr. J. C. Morris, Mr. K. L. Padman, Mr. J. G. Padman, Mr. C. H. Parker, Mr. S. J. Scott.

Mr. E. T. Emmett delivered an illustrated lecture entitled 'New Norfolk and its History', of which the following is an abstract:—

Sir John Hayes, who gave the River Derwent its name in April, 1793, sent a boat to about the spot now called 'Hayes'. On 7th March, 1804, the Reverend R. Knopwood went with Captain Mertho to the '1st Falls' just beyond New Norfolk.

The district was alluded to as 'The Hills' by the first settlers. Governor Collins visited the area in January, 1806.

Towards the end of 1807 settlers in Norfolk Island were moved to New South Wales and Van Diemen's Land, most choosing the latter. The first real shipment arrived on 28th November, 1807, and by October, 1808, 531 settlers and 23 prisoners had arrived—thus nearly doubling the island's population. A goodly proportion chose this portion of the Derwent Valley for a home, and from them it received the name 'New Norfolk'. In 1810 Surveyor Oxley reported that the land was 'so fertile as soon to preclude importing grain'. In November, 1811, Governor-in-Chief Macquarie visited the settlement and instructed that the township was to be called 'Elizabeth Town' (after his wife), but the name was not used for long.

The first real road in the island was that from Hobart Town to New Norfolk (1819) the builder being Denis McCarty, who asked for the contract to recoup him for losses sustained in a raid by bushrangers on his home. The reward he suggested was 2000 acres of land and 500 gallons of rum, duty free. The contractor's work being unsatisfactory, the road was completed by the Government. The first regular coach service in the island ran on this road (1829). Steamers began a service in 1832.

In 1838 Mr. D. Lewis wrote from Melbourne to his uncle saying: 'Melbourne is quite big—nearly as big as New Norfolk'.

The first service in St. Matthews Church of England was conducted by the Reverend Hugh Robinson on 14th August, 1825. Foundation stone of the Methodist Church was laid in November, 1835. First services of all denominations were preached under a gum-tree which has been preserved in the present school grounds.

A King's Grammar School was under erection in 1828-29.

Between 1821 and 1832 fifteen inns were listed. Of these, three remain, viz., Bush Hotel (1825), Star and Garter (1829), and Freemason's (1832). The King's Head (now Glen Derwent estate) was in business in 1822, and in 1850 the Irish exile, Smith O'Brien, was in residence there.

Hops were grown at New Norfolk in 1834.

The Lachlan (Christian name of Governor Macquarie) was originally known as '2nd River', then the 'Thames'. Turriff Lodge was erected in 1823, and was used by the early governors as a country residence.

The river was originally crossed by ferry, and the foundation stone of the first bridge was laid on 14th May, 1840. The existing bridge was opened on 29th September, 1931. New Norfolk was connected with the railway system on 1st September, 1887.

The hospital took its first patients (invalids and mental) in June, 1827. The building was handed over to the Colonial Government by the Convict Department in 1855. The first superintendent was Dr. Robert Officer (1827-1835).

Governor Arthur recommended New Norfolk for the capital and argued that it had advantages over Hobart Town, but the Committee of Enquiry he appointed reported against the proposal. Ex-Governor Sorell wrote to Earl Bathurst that Arthur's scheme was absurd. Earl Bathurst took Sorell's view, and his reply to Arthur amounted to a censure.

14TH MAY, 1945

A meeting was held in the Society's Room. Professor V. V. Hickman, Vice-President, presided.

The following were elected members of the Society:—Mrs. A. H. Clarke, Mr. H. B. Hood, Mr. J. M. Gilbert, Mr. M. Winch.

Dr. S. W. Carey delivered an illustrated lecture entitled 'Tasmania's Place in the Geological Structure of the World'.

11TH JUNE, 1945

A special meeting was convened by the Council of the Royal Society of Tasmania and the Trustees of the Tasmanian Museum and Art Gallery to give members of the Royal Society and friends of the Tasmanian Museum an opportunity of bidding farewell to His Excellency the Governor prior to his departure from Tasmania.

About 275 people were present.

Professor V. V. Hickman, Vice-President, presided.

Mr. A. L. Meston spoke briefly about the work of Governor Arthur.

Dr. W. L. Crowther spoke of the work of Governors Franklin and Eardley-Wilmot.

Mr. L. Cerutty spoke of the work of Governor Denison.

The Vice-Presidents Professor V. V. Hickman and Mr. H. Allport, and the Honorary Secretary, Dr. J. Pearson, spoke briefly about His Excellency's service to the Royal Society and conveyed the good wishes of the members of the Royal Society of Tasmania and the friends of the Museum to him before his departure.

The meeting then adjourned to the Art Gallery where coffee was served.

9TH JULY, 1945

A meeting was held in the Society's Room. Professor V. V. Hickman, Vice-President, presided.

Mr. C. Priest was elected a member of the Society.

Mr. W. E. McLean delivered an illustrated lecture entitled 'Recent Hydro-Electric Developments in Tasmania', of which the following is an abstract:—

In 1938, when the first section of the Tarraleah power scheme was put into service, the Commission had at its disposal generating plant aggregating 142,500 h.p. The old original station at Waddamana provided 66,000 h.p., the Shannon 13,500 h.p., and Tarraleah 63,000 h.p. Tarraleah had been constructed in anticipation of increasing demands on the general power system and had taken a little over 3½ years to complete. In the five years prior to 1938 the peak demand on the system had increased from 60,000 to 90,000 h.p., and the system output from 336,000,000 to 475,500,000 k.Hours or units. The capital invested had increased from £3,800,000 to £5,900,000 and the annual revenue from £390,000 to £500,000.

It was decided to complete the second stage of the Tarraleah development by adding 21,000 h.p. units and to build a second station at Waddamana and install two 16,750 h.p. units therein. In order to meet the requirements of Tarraleah it was necessary to create an artificial reservoir which, when combined with the storage in Lake St. Clair, would permit a continuous flow of 900 cusecs of the station. The fact that 900 cubic feet of water per second is equivalent to 486,000,000 gallons per day—sufficient to provide every man, woman, and child in Australia with 70 gallons a day, gives some idea of the great quantity of stored water to be provided.

In 1938 I went abroad and spent some time inspecting, among other things, the huge dams being constructed in the United States and the lessons learned during this trip have been applied to our own problems so that the work being done here is in keeping with the most advanced practice abroad.

The dam at Butler's Gorge presented many problems. It is a huge structure over 200 feet high and is arch-shaped in plan, having an upstream radius of 405 feet. The length of the crest is about 1110 feet. When the reservoir behind the dam is filled the lake formed will be approximately 6½ miles long, with a surface area of 12 square miles and containing about 66,000,000,000 gallons. An important problem associated with this type of dam is the provision of sufficient spillway to take flood waters after heavy rain or melting snow. The quantity of water passing over the dam has to be controlled so that it does no damage to the dam or the power station. Records show that floods can bring down 16,000,000,000 gallons of water per day in the Derwent River at the Gorge.

Energy stored in a flood of such magnitude is of the order of 550,000 h.p. and this has to be dissipated before the water reaches the low dam which diverts the river into the Tarraleah canal. His Excellency the Governor Sir Ernest Clark, permitted his name to be perpetuated in the dam being built at Butler's Gorge, and it will be known as the Clark Dam. Out of the 1,750,000 h.p. that can be developed, we have, so far, developed under 250,000. With at least 11 rivers along the north coast capable of generating in the aggregate about 200,000 h.p., and with the Pieman, King, Gordon, and Arthur rivers, not to mention the Arthur Lakes, there is no fear for the power-producing possibilities of Tasmania.

13th August, 1945

A meeting was held in the Society's Room. Professor V. V. Hickman, Vice-President, presided.

The following were elected members of the Society:—Miss M. L. Fraser, Miss L. G. Harris, Miss M. C. Liptrot, Miss I. Robinson, Mr. W. Asten, Mr. P. Canning, Mr. W. A. S. Gray, Mr. H. E. Hill, Mr. A. R. Shepley.

Mr. M. S. R. Sharland delivered an illustrated lecture entitled 'The Story of the Mutton-bird'.

10th September, 1945

A meeting was held in the Society's Room. Mr. A. L. Meston presided.

The following were elected members of the Society:—Mrs. M. S. Scriven, Mr. R. A. Milledge, Mr. M. L. Urquhart.

The chairman announced that a new book-plate had been designed, to be placed in the books of the Royal Society. The book-plate is in the form of the badge of the Society, with the date removed from the base and the word 'Library' incorporated.

The Reverend Canon W. Walters delivered an illustrated lecture entitled 'The Solar System'.

8th October, 1945

A meeting was held in the Society's Room. Professor V. V. Hickman, Vice-President, presided.

It was announced that the body of a crab-eating seal, *Lobodon carcinophaga*, 6 feet 6 inches in length from nose to tip of hind limbs, had been found near Ralph's Bay Neck Canal on 7th September, 1945. It is the first record of one of these species from Tasmania. The habitat of the seal is along the shores of the Antarctic.

Mr. W. H. Hudspeth delivered an illustrated lecture entitled 'Note on Cottage Green'. (See page 129.)

13th November, 1945

A meeting was held in the Society's Room. His Excellency the Administrator, Sir John Morris, presided.

The following were elected members of the Society:—Mr. V. G. Burley, Hon. E. Dwyer-Gray, Mr. W. S. Fairbridge, Mr. R. A. T. Millsom.

The following papers which had been submitted for publication in the Society's Journal were tabled, and it was agreed to submit them to the Standing Committee:—

Notes on the Lepidoptera-Rhopalocera of Tasmania. By L. E. Couchman. (See page 49.)

A Description of *Sterrhurus macrorchis* n. sp., with Notes on the Taxonomy of the genus *Sterrhurus* Looss (Trematoda-Hermiuridae). By P. W. Crowcroft. (See page 39.)

Notes on the Tasmanian Marine Crayfish, *Jasus lalandii* (Milne Edwards). By V. V. Hickman. (See page 27.)

A Summary of the Tasmanian Phreatoicids: A Contribution to the Biological Survey of Tasmania. By G. E. Nicholls. (See page 55.)

The Affinities of the Rat-kangaroos (Marsupialia) as revealed by a comparative study of the Female Urogenital System. By Joseph Pearson. (See page 13.)

Dr. F. W. Clements, Chairman of the Nutrition Committee, Australian National Health and Medical Research Council, delivered an illustrated lecture entitled 'Problems of Human Nutrition in Tasmania'. (See page 1.)

The following gifts were made to the Society during the year:—

Letter from Michael Maxwell Shaw to William Boyer, presented by the recipient's son, Mr. G. P. Boyer.

J. Wilkinson, Chemist—two account books, 1850-53 and 1859, presented by the Executors of the estate of the late F. P. Wilkinson.

The original diary of George Meredith, 1823, presented by his Great-granddaughter, Mrs. Archer Taylor, of Western Australia.

Northern Branch.

Annual Report, 1945.

No meetings of the Branch were held during 1945, chiefly owing to the position of Hon. Secretary being vacant. At the recent Annual General Meeting plans were considered for reviving interest in the Branch. These plans consist in the organisation of a research project relating to Northern Tasmania which will take into account the interests of as wide a group of members as possible. The project is visualised as covering a scientific survey of the Launceston region, together with its history and ethnology.

With slight modifications, the constitution of the Royal Society was adopted for the Northern Branch. The following officers were elected:—

Chairman: F. Smithies, 1946, 1947.

Vice-Chairman: G. C. McKinlay, 1946.

Council: T. Doe, B.Sc., 1946, 1947; J. E. Heritage, LL.B., 1946; J. R. Forward, 1946, 1947; R. E. Smith, 1946.

Hon. Secretary-Treasurer: N. J. B. Plomley, B.Sc.

The Royal Society of Tasmania

List of Members, 1945

Honorary Members

MAWSON, Sir Douglas, Kt., O.B.E., B.E., D.Sc., F.R.S., Professor of Geology and Mineralogy, the University, Adelaide.

WOOD-JONES, Professor F., M.D., D.Sc., F.R.C.S., L.R.C.P., F.R.S., the University, Anatomy Department, Manchester, England.

Corresponding Members

Year of Election.

1901 BENHAM, W. B., Sir, M.A., D.Sc., F.R.S., F.Z.S., Emeritus Professor of Biology, the Universtiy of Otago, Dunedin, New Zealand.

1901 WALL, Professor A., M.A., Canterbury College, Christchurch, New Zealand.

Life Members

1918 AVERY, J., 4 Kelvin Grove, Prahran, S.1, Victoria.
1945 BARNETT, H. S., 15 Pirie Street, New Town, Hobart.
1937 BISDEE, C. E., Hotel Australia, Melbourne, C.1.
1945 CAREY, S. W., D.Sc., 27 Augusta Road, New Town, Hobart.
1938 FOSTER, Francis H., 'Wivenhoe', 137 Hampden Road, Hobart.
1944 MURRAY, Mrs. James, 7a Heathfield Avenue, Hobart.
1945 GILBERT, J. M., 79 Oldham Avenue, New Town, Hobart.
1944 GRANT, C. H., 7 Quorn Street, Sandy Bay, Hobart.

Members Receiving the Papers and Proceedings

1932 ANGEL, S., 41 Red Chapel Avenue, Sandy Bay, Hobart.
1928 ALLPORT, Henry, LL.B., 111 Macquarie Street, Hobart.
1926 ATKINS, C. N., M.B., B.S., D.P.H., 134 Macquarie Street, Hobart.

1921 BAKER, H. S., LL.M., D.S.O., Finlay, Watchorn, Baker, and Turner, 32 Murray Street, Hobart
1926 BARRETT, Archdeacon W. R., Christ College, 149 Park-st., Hobart.
1942 BAULCH, W., Gordon Institute of Technology, Geelong, Victoria.
1945 BERRIMAN, Miss P., 15 Toorak Avenue, New Town, Hobart.
1945 BETHUNE, Miss M., 31 Fitzroy Place, Hobart.
1944 BLACKWOOD, B. H., 11 Lord Street, Sandy Bay, Hobart.
1924 BOOTH, N. P., The Homestead, Rosetta, *via* Glenorchy.
1941 BOSS-WALKER, I. R., 105 Macquarie Street, Hobart.
1944 BOYES, C. E., 9 Mortimer Avenue, New Town, Hobart.

Year of Election.

1945 BURLEY, V. G., 555 Sandy Bay Road, Hobart.
1945 BURROWS, N. L., 1 Roope Street, New Town, Hobart.
1934 BRETT, R. G., 7 Petty Street, West Hobart.
1939 BROWN, Miss G. M. F., 56 Bellevue Parade, New Town, Hobart.

1945 CANNING, P., 'Moonbi', Cavell Street, West Hobart.
1939 CERUTTY, L., B.A., Dip.Ed., 65 Montagu Street, New Town, Hobart.
1929 CHAPMAN, G. T. F., 272 Davey Street, Hobart.
1942 CHARLES, Mrs. E. A., St. Chad, Fern Tree.
1945 CLARKE, Mrs. A. H.; c/o Mrs. Cawthorne, Risdon Road, Lindisfarne.
1940 CLELAND, Professor J. B., M.D., Professor of Pathology, University of Adelaide, South Australia.
1910 CLEMES, W. H., B.A., B.Sc., Pendennis, Eaglehawk Neck.
1944 CLIVE, R. A., Ballerton, Old Beach.
1922 COLLIER, J. D. A., State Librarian, Hobart.
1944 COLLINS, T. G., 7 Stoke Street, New Town, Hobart.
1945 COUCHMAN, L. E., 35 Brown Street, West Hobart.
1943 COUNSEL, J. M., 11 Stoke Street, New Town, Hobart.
1939 CRAIG, C., M.B., B.S., 21 High Street, Launceston.
1939 CRAWFORD, G. H.; c/o Douglas and Collins, 27 Paterson Street, Launceston.
1942 CROWCROFT, P., B.Sc., the University, Hobart.
1911 CROWTHER, W. E. L. H., D.S.O., V.D., M.B., 190 Macquarie Street, Hobart.
1944 CRUICKSHANK, J. A. T., Red Lodge, Tolosa Street, Glenorchy.
1940 CURTIS, Miss W. M., M.Sc., 33a York Street, Sandy Bay, Hobart.
1939 CUTHBERTSON, J. E., 58 Elizabeth Street, Hobart.

1944 DAKIN, H. L., 89 Macquarie Street, Hobart.
1944 DE BAVEY, F. X., A.A.C.I., Cascades, Hobart.
1938 DOE, T. E., State High School, Launceston.
1944 DUNCAN, C., M.B., B.S., B.Sc., 24 Campbell Street, Hobart.

1939 EDWARDS, A. B., Ph.D., M.Sc., Geology Department, University of Melbourne, Carlton, N.3.
1919 ELLIOTT, E. A., M.B., Ch.M., 128 Main Road, New Town, Hobart.
1942 ELMS, E. A., 6 Howard Street, Invermay, Launceston.
1921 EMMETT, E. T., Royal Autocar Club of Tasmania, Hobart.
1918 EVANS, L. A., 11 Beach Road, Lower Sandy Bay, Hobart.
1933 EXLEY, H. J., M.A., Deputy Commonwealth Statistician, 4th Floor, T. & G. Building, Hobart.
1921 EYRE, M. H., Boys' Welfare School, Hobart.

1944 FERGUSON, N. D., 10 Toorak Avenue, New Town, Hobart.
1944 FERNYHOUGH, F., Menzies Hotel, Melbourne, C.1.
1943 FITZPATRICK, G., Prudent Investors Pty. Ltd., 119 Macquarie Street, Hobart.
1939 FLACH, A., M.E., St. Ives, 86 Montpelier Road, Hobart.
1918 FLETCHER, C. E., M.A., Education Department, Hobart.
1940 FORD, Miss J. Munro, 2 Melville Street, Hobart.

1908 GIBLIN, Professor L. F., D.S.O., B.A.; c/o Department of the Treasury, Canberra, A.C.T.
1924 GIBLIN, W. W., C.B., V.D., M.R.C.S., L.R.C.P., 142 Macquarie Street, Hobart.

Year of Election.

1941 GLENNIE, J., 23 Trevallyn Terrace, Trevallyn. Launceston.
1937 GORDON, H. D., B.Sc., Ph.D. (Edin.), the University, Hobart.
1943 GUNSON, Dr. Jean, M.B., B.S., 451 Sandy Bay Road, Hobart.

1931 HAMILTON, J. Bruce, M.B., Ch.M., 174 Macquarie Street, Hobart.
1932 HARVEY, D. H., Harvey Lane, Sandy Bay, Hobart.
1944 HELMS, A. D., B.Sc., Forestry (Copenhagen), 10 Lynton Avenue, Hobart.
1944 HENDERSON, Q. J., Department of Mines, Hobart.
1921 HERITAGE, J. E., 55 Paterson Street, Launceston.
1915 HICKMAN, Professor V. V., B.A., D.Sc., 69 Cross Street, New Town, Hobart.
1933 HILLER, B., M.B., B.S., 174 Macquarie Street, Hobart.
1918 HOGG, G. H., M.D., C.M., 37 Brisbane Street, Launceston.
1944 HOOKEY, Miss M., Rokeby House, Rokeby.
1943 HOPE, C. N., Berry Bank, Fern Tree.
1935 HUDSPETH, W. H., Greystanes, Red Chapel Avenue, Sandy Bay, Hobart.
1944 HULL, E. D., M.B., Ch.M. (Syd.), 134 Macquarie Street, Hobart.
1909 HUTCHISON, H. R., 115 Macquarie Street, Hobart.

1942 ICK, E. T. J., M.B., B.S. (Melb.), P.O. Box 39, St. Helens, Tasmania.
1939 ISRAEL, G. C., M.Sc., A.I.C., A.A.C.I., Technical College, Hobart.

1944 JENSEN, L. R., 319 Park Street, New Town, Hobart.
1919 JACKSON, G. A., 97 Collins Street, Hobart.
1936 JAEGER, J. C., M.A., D.Sc. (Syd.), the University, Hobart.
1944 JOHNSON, Eric M., K.C.; c/o Tasmanian Club, Hobart.

1945 KAHAN, Miss D. M.; c/o Lady Gowrie Child Centre, Hobart.
1941 KALMBERG, C. E.; c/o Australian Newsprint Mills Pty. Ltd., Karanya, *via* Westerway, Tasmania.
1922 KEMP, Andrew G., 17 Stoke Street, New Town, Hobart.
1927 KING, Professor C. S., M.C., M.A., 56 Clare Street, New Town, Hobart.
1927 KNIGHT, F. C. E., Windermere Park, Claremont.
1918 KNIGHT, C. E. L., Claremont.

1937 LEWIS, H. C., 126 Collins Street, Hobart.
1945 LIPTROT, Miss M., 10 Duke Street, Sandy Bay, Hobart.
1937 LITTLE, E. W., 9 Dalton Street, West Hobart.
1943 LIVINGSTON, L. H., 808 Sandy Bay Road, Hobart.

1919 MACKAY, A. D., 26 High Street, Launceston.
1933 MACLEAN, W. E., M.I.E. (Aust.), Hydro-Electric Commission, Hobart.
1944 MAPLESTONE, P. A., D.S.O., D.Sc., M.B., B.S., D.T.M., Lachlan Park, New Norfolk.
1934 MARTIN, D., B.Sc., C.S.I.R., P.O. Box 17, Huonville.
1931 MASTERS, W. E., Bellerive.
1944 MAXWELL, A. W., La Belle Alliance, Cambridge.
1923 MCAULAY, Professor, A. L., F.Inst.P., B.Sc. (Tas.), M.A. (Cantab.), Ph.D. (Manchester), Long Way, Maning Avenue, Sandy Bay, Hobart.
1944 MCAULAY, Miss I., 548 Sandy Bay Road, Hobart.
1944 MCINTOSH, R., M.B., B.S., 180 Macquarie Street, Hobart.
1930 MCINTYRE, J. A. L.; c/o Butler, McIntyre, and Butler, 22 Murray Street, Hobart.

Year of Election.

1935 McKinlay, G. C., Glenfruin, 1 Brisbane Street, Launceston.
1941 McShane, C. C., B.A., Dip.Ed., 14 Pine Street, West Hobart.
1939 Meldrum, G. K., B.V.Sc., Department of Agriculture, Hobart.
1926 Meredith, David, 291 Sandy Bay Road, Hobart.
1921 Meston, A. L., M.A., Marnoch, Windsor Street, Glenorchy.
1944 Millar, J. P., M.B., B.S., 163 Macquarie Street, Hobart.
1945 Milledge, R. A.; c/o Department of Public Works, Ulverstone.
1945 Miller, L. W., M.Agr.Sc., Department of Agriculture, Hobart.
1943 Morris, Miss Gwladys E., B.A., 45 New Town Road, Hobart.
1941 Morris, Lady, Wimmarleigh, Brown's River Road.
1944 Morris, O. V., Commercial Bank of Australia, Hobart.
1944 Murphy, V. S., M.A. (Oxen.), B.A. (West. Aus.); c/o Hale School, West Perth, Western Australia.
1929 Murray, J. F. N., Long View Avenue, Sandy Bay, Hobart.
1943 Muir, J. B. G., M.B., M.S., F.R.C.S., Royal Hobart Hospital, Hobart.

1944 Needham, Mrs. G., Hobart High School, Letitia Street, Hobart.
1933 Nicholas, Miss Doris H., Millbrook, Ouse.
1937 Nicholas, Mrs. 34 Beresford Road, Rose Bay, New South Wales.
1921 Nye, P. B., B.M.E., 94 Limestone Avenue, Ainslie, A.C.T.

1924 Oliver, H., Lindisfarne.

1923 Parker, H. T., 41 Proctors Road, Hobart.
1929 Pearce, Harold, 11 Ellington Road, Sandy Bay, Hobart.
1944 Pearse, Captain D. C., M.C., Tasmanian Museum, Hobart.
1944 Pearson, J., D.Sc., F.R.S.E., F.L.S., Tasmanian Museum, Hobart.
1927 Penman, C. J., 7 Mary Street, Launceston.
1939 Phillips, P. G., 38 Upton Street, Launceston.
1902 Piesse, E. L., B.Sc., LL.B., Merridale, 43 Sackville Street, Kew, E.4, Victoria.
1943 Piggott, J. B., LL.B., 28 Murray Street, Hobart.
1910 Pillinger, J., 4 Fitzroy Crescent, Hobart.
1938 Plomley, N. J. B., B.Sc., Director, Queen Victoria Museum, Launceston.

1935 Radcliffe, C. E., Red Chapel Road, Sandy Bay, Hobart.
1937 Ralph, B. J. F., B.Sc.; c/o C.S.I.R. Forests Products Division, 69-71 Yarra Bank Road, South Melbourne.
1938 Raphael, T., M.A., Dip.Hort. (Cantab.), Department of Agriculture, Hobart.
1936 Ratten, V. R., C.B.E., M.D., 167 Macquarie Street, Hobart.
1944 Raymond-Baker, Mrs. E., 210 Orrong Road, Toorak, S.E.2, Melbourne.
1939 Read, H. J., 20 Waverley Avenue, New Town, Hobart.
1930 Read, Sister K. L., 8 Auvergne Avenue, New Town, Hobart.
1937 Reid, J. S., M.B., Ch.M. (Syd.), 151 Macquarie Street, Hobart.
1931 Rex, M., Hobart Savings Bank, Wynyard.
1943 Roberts, R. H. L., 592 Sandy Bay Road, Hobart.
1943 Robertson, F. C., B.A., N.B., Ch.M., 171 Macquarie Street, Hobart.
1921 Rolph, W. R., 'The Examiner' Office, Launceston.

1922 Sargison, H. F., 21 Elizabeth Street, Hobart.
1931 Scott, E. O. G., B.Sc., Plooranaloona, Penquite Road, Launceston.
1945 Scriven, Mrs. M. S., Garelcch, 548 Sandy Bay Road, Hobart.

Year of Election.

1944 SHAW, Mrs. H., 251 Davey Street, Hobart.
1945 SHEPLEY, A. R.; c/o Hydro-Electric Commission, Hobart.
1921 SHIELDS, Hon. T., M.L.C., 13 Paterson Street, Launceston.
1925 SHOOBRIDGE, R. O., Forest Lodge, Glenora.
1944 SMITH, R. N., B.E., Flat 8, 326 Davey Street, Hobart.
1936 SMITH, Major R. E., 17 Trevallyn Crescent, Launceston.
1921 SMITHIES, F., 34 Paterson Street, Launceston.
1932 SOMERVILLE, Miss J., B.Sc., Tasmanian Museum, Hobart.
1944 SOUTHCOTT, W. H., B.V.Sc.; c/o Department of Agriculture, Hobart.
1930 STEANE, S. W., B.A., F.R.G.S., Conservator of Forests, Hobart.

1943 THOMAS, D. E., D.Sc., Department of Mines, Treasury Gardens, Melbourne.
1930 TRAVERS, Miss C., Fisher Avenue, Sandy Bay, Hobart.
1944 TRAVERS, Miss I. D., Fahan, 361 Sandy Bay Road, Hobart.
1934 TRIEBEL, L. A., M.A. (London), D.Litt., the University, Hobart.
1927 TURNER, A. Jefferis, M.D., F.E.S., Dauphin Terrace, Brisbane, Queensland.

1934 URQUHART, D. M., 29 Maning Avenue, Sandy Bay, Hobart.
1945 URQUHART, M. L., 29 Maning Avenue, Sandy Bay, Hobart.

1942 VAN GOOCH, Miss L., Queen Victoria Museum, Launceston.
1942 VAUGHAN, H. G., 545 Sandy Bay Road, Hobart.

1930 WALCH, Christine, M.B., Ch.M., 171 Macquarie Street, Hobart.
1927 WALCH, J. H. B., M.B., 171 Macquarie Street, Hobart.
1918 WALCH, P. B. C.; c/o J. Walch and Sons, Macquarie Street, Hobart.
1928 WALTERS, Rev. W., Th.Schol., F.R.A.S., The Rectory, Bothwell.
1941 WARDROP, A. B., 2 Lasswade Avenue, Sandy Bay, Hobart.
1944 WATT, Alex., 17 Augusta Road, New Town, Hobart.
1922 WAYN, Miss A. L., 73 Federal Street, Hobart.
1927 WELLS, F., 5 Gladstone Street, Hobart.
1943 WHITE, N. H., M.Sc., Plant Pathologist, Department of Agriculture, Hobart.
1942 WOLFHAGEN, F. C., 86 Collins Street, Hobart.
1934 WUNDERLY, J., L.D.S., B.S.Sc., P.O. Box 1997 S, Elizabeth Street, Melbourne, C.1.

Members who do not Receive the Papers and Proceedings

1921 ALLEN, D. V., B.Sc., 4 Balfour Street, Launceston.
1944 AMOS, H., Glen Gala, Swansea.
1938 ARCHER, Mrs. D., 538 Sandy Bay Road, Hobart.
1945 ASTEN, W., Teachers' College, Hobart.

1937 BALDWIN, C. W., 145 Hampden Road, Hobart.
1924 BENNETT, H. W., L.D.S., D.D.S., 2 Wright Street, East Devonport.
1942 BENNETT, Max, Clarendon House, Clarendon Street, Melbourne East.
1920 BLAIKIE, T. W., 32 Adelaide Street, South Hobart.
1907 BROWNELL, F. L., Roxburgh House, 160 Elizabeth Street, Hobart.
1944 BURN, Professor A., M.Sc. (Tas.), B.E. (Syd.), 22 Parliament Street, Hobart.
1937 BURT, L. A., 38 Mawhera Avenue, Sandy Bay, Hobart.

Year of Election.

1945 BUTCHER, Miss P., 103 York Street, Sandy Bay, Hobart.
1931 BUTLER, C. T., 22 Murray Street, Hobart.
1923 BUTLER, Mrs. G. H., 30 Augusta Road, New Town, Hobart.
1944 BUTLER, Miss M. T., Willowdene Avenue, Sandy Bay, Hobart.
1930 BUTLER, Terence, M.R.C.S., L.R.C.P., 'Glenroch', 432 Huon Road, Hobart.

1931 CAMPBELL, C. J., 135 King Street, Sandy Bay, Hobart.
1931 CHEPMELL, C. H. D., Legislative Council, Hobart.
1934 COURTHOPE, Mrs. R. I., 113 King Street, Sandy Bay, Hobart.
1944 CRAMP, G. C., 'Cobbity', 4a D'Arcy Street, Hobart.
1936 CRONLEY, B. J., 18 Glebe Street, Hobart.
1945 C.S.I.R. Fisheries Division (W. S. Fairbridge, Department of Agriculture, Hobart).

1937 DAVERN, Miss N., 64 St. George's Terrace, Hobart.
1943 DOWLING, Mrs. A., Chew Magna, Ross.
1932 DUMARESQ, Miss E., Queen Alexandra Hospital, Hampden Road, Hobart.

1944 EZZY, Rev. R. A., Th.L., St. Paul's Rectory, St. Helens.

1934 FAY, Frank W., M.B., B.S., 174 Macquarie Street, Hobart.
1944 FEWTRELL, H. P., The Very Rev., Dean of Hobart, 9 Pillinger Street, Sandy Bay, Hobart.
1921 FORWARD, J. R., Public Library, Launceston.
1945 FRASER, Miss M. L., 34 Adelaide Street, South Hobart.

1942 GEPP, T. A., 9 Mortimer Avenue, New Town, Hobart.
1931 GIBSON, Stuart, M.B., B.Sc., 175 Macquarie Street, Hobart.
1944 GOULD, J. H., 73 Liverpool Street, Hobart.
1932 GRACE, W. L., B.A., Dip.Ed., F.R.G.S., M.R.S.T., 10 College Street, Launceston.
1945 GRAY, W. A. S., Commonwealth Bank, Hobart.

1924 HALL, E. L., 38 Lyttleton Street, Launceston.
1945 HARRIS, Miss L. G., 172 Macquarie Street, Hobart.
1943 HARVEY, Miss E. M., 299 Macquarie Street, Hobart.
1945 HILL, H. E., Government Analyst, 24 Campbell Street, Hobart.
1939 HOLMAN, W. P., M.B., B.S. (Melb.), F.R.A.C.P., F.F.R., (London), 34 Elphin Road, Launceston.
1945 HOOD, H. B., 664 Sandy Bay Road, Hobart.
1944 HUBBLE, G. D., 27 Proctors Road, Hobart.
1945 HULL, J. L., 15 Mount Stuart Road, Hobart.
1923 HUNGERFORD, Mrs. L., Flat 5, 3 Carmyle Avenue, Toorak, Victoria.
1944 HUTCHIN, Major A. W., D.S.O., Dip.Ed., P.S.C., 346 Davey Street, Hobart.

1944 JACOBS, T., 65 Augusta Road, New Town, Hobart.
1943 JENSEN, Miss C., 174 Macquarie Street, Hobart.
1929 JOHNSON, W. R., Clemes College, New Town, Hobart.
1922 JOHNSTON, J. R.; c/o Johnston and Miller, Murray Street, Hobart.

1944 KELLY, H. G., 13 Ellington Road, Sandy Bay, Hobart.
1927 KIRBY, E. R., 13 Forbes Avenue, West Hobart.
1944 KNIGHT, Miss D. M., 21 Cromwell Street, Battery Point, Hobart.
1937 KNIGHT, Miss E. I., Windermere Park, Claremont.
1937 KNIGHT, Miss L. E., Windermere Park, Claremont.

Year of Election.

1938 LINES, D. H. E., M.B., Ch.B., 9 Archer Street, New Town, Hobart.
1934 LORD, Mrs. C. E., Telopea, 5 Quorn Street, Sandy Bay, Hobart.

1944 MAGNER, J., L.R.C.S., L.R.C.P., L.M., 176 Macquarie Street, Hobart.
1944 MATHER, W. B., 'Ravenswood', 124 Domain Road, South Yarra, S.E.1, Victoria.
1928 MCELROY, J. D., Hotel Metropole, Brisbane Street, Launceston.
1944 MCINTYRE, R. S., Shell Company of Australia Ltd., Hobart.
1945 MILLSOM, R. A. T., 361 Argyle Street, Hobart.
1944 MORRIS, R., O.B.M., 36 Elizabeth Street, Hobart.
1931 MURRAY, James, 7a Heathfield Avenue, Hobart.
1944 MURRAY, Mrs. M., 15 Ratho Street, New Town, Hobart.

1932 OCKENDEN, D., Central Avenue, Moonah.
1944 ORBELL, Mrs. H. C., 29 View Street, Sandy Bay, Hobart.
1944 ORBELL, H. C., 29 View Street, Sandy Bay, Hobart.
1941 O'MAY, H., Elouera, Bellerive.
1921 OVERELL, Miss L., 326 Davey Street, Hobart.

1923 PEDDER, A., Sherborne, Upper Argyle Street, Hobart.
1930 PERKINS, Mrs. C. H., 16 Turner Street, Fitzroy Place, Hobart.
1926 PITMAN, Professor E. J. G., B.A., B.Sc., the University, Hobart.
1945 PRIEST, C. S., 105 Newdegate Street, Hobart.

1944 REID, Miss Marjorie, Blairlogie, Ethelmont Road, Sandy Bay, Hobart.
1943 ROBERTSON, Rev. C. C., The Rectory, 195 Main Road, Moonah.
1925 ROBINSON, F. G., 83 Princes Street, Dynnyrne, Hobart.
1945 ROBINSON, Miss Irene, 83 Princes Street, Dynnyrne, Hobart.

1941 SHARLAND, M. S. R., 141 Hampden Road, Hobart.
1943 SHEPPARD, B. A., 475 Sandy Bay Road, Hobart.
1944 SHIELD, R. J., 26 Elphinstone Road, Hobart.
1925 SHOOBRIDGE, K., Glenora.
1942 SMITH, Roy, P.O. Box 307, Launceston.
1944 SNOW, W. C., 25 Toorak Avenue, New Town.
1938 SOMERVILLE, J. L., First Avenue, New Norfolk.
1938 STERNBERG, O. J., 70 Doyle Avenue, New Town.
1937 STOPS, W. J. T., 116 Collins Street, Hobart.

1928 TURNER, Col. J. W., V.D., 1 Mona Street, Battery Point, Hobart.

1945 USHER, F., 15 Knocklofty Terrace, West Hobart.

1944 VON STIEGLITZ, Karl, 'Andora', Evandale, Tasmania.

1944 WALCH, G. A., 654 Sandy Bay Road, Hobart.
1945 WATERWORTH, P. H., Optical Munitions Annexe, G.P.O. Box 113 D, Hobart.
1926 WAUGH, E. C., LL.B., 153 Macquarie Street, Hobart.
1930 WEBSTER, E. H., 4 Red Chapel Avenue, Sandy Bay, Hobart.
1937 WILLIAMS, T. V., Lighthouse and Navigation Services, Customs House, Hobart.
1937 WILLIAMS, Mrs. W. H., 8 Wellesley Street, South Hobart.
1943 WILSON, C. E., 469 Sandy Bay Road, Hobart.
1942 WILTON, Miss O., 37 Elizabeth Street, Hobart.
1945 WINCH, M., 45 Cross Street, New Town, Hobart.

Year of Election.	Associate Members (10s. Per Annum)
1944	BROWNELL, K. G., 68 Doyle Avenue, New Town, Hobart.
1945	CUNNINGHAM, T. M., Christ College, 149 Park Street, Hobart.
1945	EDWARDS, B. A. B., 15 Parliament Street, Sandy Bay, Hobart.
1945	ELLIOTT, C., 26 Bay Road, New Town, Hobart.
1945	FROST, D. I., Taroona.
1944	FYVIE-WATT, Miss M., 'Moonbi', 17 Cavell Street, West Hobart.
1944	HART, Miss M., 51 Davey Street, Hobart.
1945	LUCK, Miss B., 51 Davey Street, Hobart.
1944	MOIR, J. D., 31 Faraday Street, West Hobart.
1945	MORRIS, J., Christ College, 149 Park Street, Hobart.
1945	PADMAN, J. G., 25 Stoke Street, New Town, Hobart.
1945	PADMAN, K., 73 Argyle Street, Hobart.
1945	PARKER, Colin H., 16 Pillinger Street, Sandy Bay, Hobart.
1945	SCOTT, S. J., 9 Lincoln Street, Sandy Bay, Hobart.

ROYAL MUSEUM OF VICTORIA

H H Pimblett, Government Printer, Tasmania.

PAPERS AND PROCEEDINGS

OF

THE ROYAL SOCIETY OF TASMANIA

FOR THE YEAR

1946

NATIONAL MUSEUM
31 JAN 1948
VICTORIA

Edited by
JOSEPH PEARSON
and
D. COLBRON PEARSE

PUBLISHED BY THE SOCIETY
The Tasmanian Museum and Art Gallery, Hobart

15.10.47

Price: Ten Shillings

The Royal Society of Tasmania

Papers and Proceedings, 1946

CONTENTS

	Page
Note on *Anthobothrium hickmani*, a new cestode from the Tasmanian electric ray (*Narcine tasmaniensis* Richardson). By P. W. Crowcroft	1
Some digenetic trematodes from fishes of shallow Tasmanian waters. By P. W. Crowcroft	5
Pontobdella tasmanica nom. nov. (Hirudinea). By V. V. Hickman	27
Note on *Hesperilla chrysotricha plebeia* Waterhouse (Lepidoptera-Hesperiidae). By L. E. Couchman	29
Phyllachne Colensoi (Berggren), an Addition to the List of Sub-Antarctic Plants in the Tasmanian Flora. By W. M. Curtis	31
Leaves from the diary of a Van Diemen's Land Official. By W. H. Hudspeth	35
The Diary of the Rev. Robert Knopwood, 1805-1808	51
Annual Report, 1946	126
Abstracts of Proceedings	131
Subject Index to Papers of Roy. Soc. Tas., 1898-1944	143

Pap. and Proc. Roy. Soc. Tasmania, 1946 (15th October, 1947)

Note on *Anthobothrium hickmani*, a new cestode from the Tasmanian electric ray (*Narcine tasmaniensis* Richardson)

By

Peter W. Crowcroft

University of Tasmania

(Read 5th Nov., 1946)

(5 Text figures)

The presence of Tetraphyllid cestode in the spiral valve of *Narcine tasmaniensis* was pointed out to me by Professor V. V. Hickman, who kindly made available a mount of a scolex and a number of proglottides collected by him some years ago. In April, 1945, two rays were examined for parasites. One contained one worm and the other two worms. The first specimen also yielded a single mobile free proglottid. No gravid proglottides were found. Three small specimens of the same ray examined in June, 1945, appeared free from the cestode.

The tape worm proves to be a hitherto undescribed species of the genus *Anthobothrium* van Ben., 1850. There does not appear to be any previous record of a species of this genus in Australian waters.

Fig. 1.—*Anthobothrium hickmani* n.sp. Whole mount of a mature scolex (1·5 mm. across).

Fig. 2.—Whole mount of a less mature scolex than Fig. 1 (0·6 mm.).

External Features: Scolex

The scolex bears four simple pedunculate bothridia, two of which are dorsal and two ventral in position. Each bothridium has the form of a shallow cup, the outer edge of which is formed into a single row of shallow loculi. The form and proportions of the scolex vary with its age and with the degree of contraction of the bothridia. A mature expanded scolex is reminiscent in form of a four-leafed clover. The loculi are more readily seen in the living condition than in mounted material. They may extend completely around the margin of the bothridium or may be lacking from the proximal margin. In the youngest scolex collected, loculi are not in evidence (fig. 3). At the apex of the scolex there is a blunt elevated myzorhynchus which contains a well-developed sucker. In the young specimens whose bothridia do not possess well-developed loculi, this is quite similar to a typical Trematode acetabulum, but the mature scolex possesses a less distinctive structure. This would seem to indicate that a degeneration of the sucker accompanies the expansion and development of the bothridia.

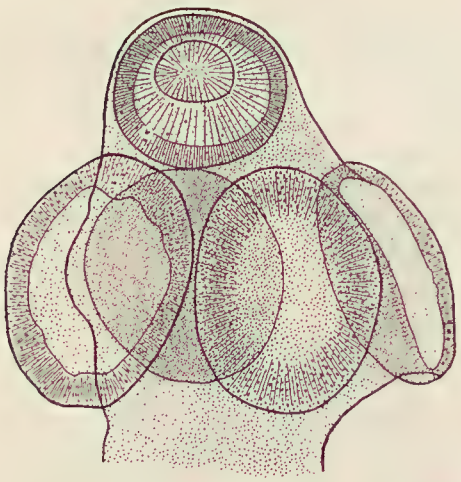


Fig. 3.—Whole mount of a very young scolex (approx. 0·5 mm. across).

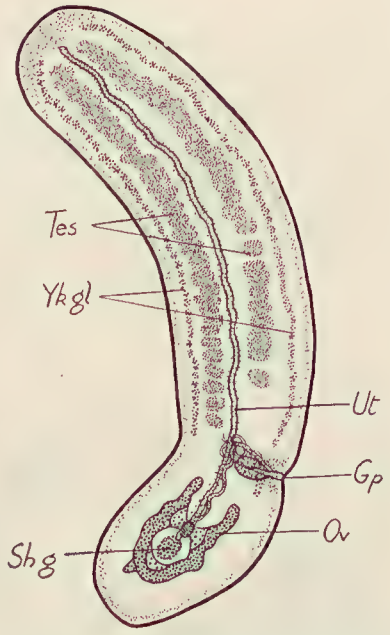


Fig. 4.—Whole mount of a free mobile proglottid.

The Strobila

The scolex is followed by a short neck region in which no strobilation is visible. The length of the neck varies with the age and degree of contraction. The proximal proglottides are extremely short (fig. 2), but they become progressively more elongate until at the posterior end they measure 1·2 mm. long and 0·5 mm. wide. The longest worm collected comprised 105 distinguishable proglottides. The strobila is slightly flattened in transverse section and each proglottid is slightly constricted at the level of the genital pore, which is approximately ¼ of its length in front of the posterior end. The genital pores are marginal and alternate irregularly. The proglottides may become free before fertilisation.

Genital System

Male: There are approximately 60 testes arranged in two single or double rows, lying on either side of the mid-line in the anterior two-thirds of the proglottid. They are somewhat compressed in the mounted specimens measuring approximately 0·6 mm. in diameter. The vas deferens describes several coils before entering the base of the cirrus sac. Within the sac it expands immediately into an unarmed muscular cirrus which runs directly through the sac to the genital atrium. The cirrus is composed of outer longitudinal and inner circular fibres. The sac is ovoid and measures 0·1 mm. long and 0·06 mm. in diameter. In sections of apparently fully-developed proglottides the wall of the sac is membranous and contains no distinct muscle fibres. The space within the sac not occupied by the cirrus is filled by the prostate gland. No distinct cells are visible the gland consisting of a matrix containing numerous small spherical nuclei. The genital atrium is a deep tubular depression 0·76 mm. long and 0·36 mm. in diameter which extends directly inwards from the genital pore to the outer end of the cirrus sac.

Female: The ovary is a U-shaped body which occupies the proglottid posterior to the genital pore. In transverse section the lateral arms of the U, which are directed forwards, are seen to be expanded dorsally and ventrally and constricted medially. Mid-way along their length the two lateral arms taper and come together into oviducts which fuse in the mid-line and pass into a fertilisation chamber. A

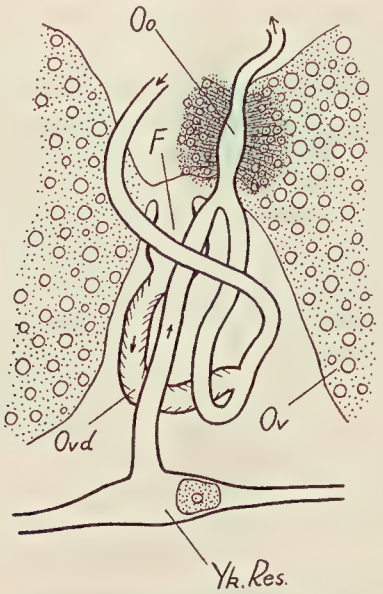


Fig. 5.—Diagram of female complex drawn from transverse sections.

transverse section through this region shows the dorsal and ventral lobes of the arms arranged in the form of an "X." The female duct runs directly ventrally from the fertilisation chamber as a wide ciliated tube. It fuses with the vagina, loses its ciliated lining, and runs dorsally to the level of its origin. Here it fuses with the central yolk duct and enters the shell gland. This is a compact ovoid mass containing numerous small nuclei, arranged radially about the ootype. Beyond

the shell gland the female duct passes into the uterus, which runs forward between the two rows of testes as a wide tube, and extends almost to the anterior end of the proglottid. The vitellaria are very numerous small follicles closely packed into two lateral rows, which extend from the anterior end of the proglottid to just in front of the genital pore. The yolk-collecting ducts from each side unite into a transverse reservoir below the central female complex. The central yolk duct runs directly dorsally from the reservoir to join the female duct. The terminal portion of the vagina lies beside the cirrus sac. It describes a convoluted path backwards between the ovary lobes and descends to enter the oviduct. Throughout its length it is surrounded by very numerous nuclei.

As no gravid specimens were obtained the eggs are not described. The gravid proglottides in the mount supplied by Professor Hickman show the usual shrinkage and distortion of the eggs. These specimens exhibit break-down of the organs of reproduction and expansion of the uterus into a large irregularly lobed sac occupying the whole of the proglottid in front of the genital pore.

Affinities

Anthobothrium hickmani differs from most species of the genus in the relatively simple form of the scolex. It seems most related to *Anthobothrium (Echeinobothrium) simplex* Shipley and Hornell from which it differs in the possession of a distinct myzorhynchus.

References

Southwell, T., 1925.—A monograph on the *Tetraphylidea*. *Liverpool School Trop. Med. Mem. N.S.* no. 2, 1925.

Abbreviations used in Text Figures.

F, fertilisation chamber; *Gp*, genital pore; *Oo*, ootype; *Ov*, ovary; *Ovd*, oviduct; *Shg*, shell gland; *Tes*, testes; *Ut*, uterus; *Ykgl*, yolk glands; *YkRes*, yolk reservoir.

Some digenetic trematodes from fishes of shallow Tasmanian waters

By

Peter W. Crowcroft

Demonstrator in Zoology, University of Tasmania

(Read 5th November, 1946)

Abbreviations used in Text Figures

C, cirrus; *Cs*, cirrus sac; *Cut*, cuticle; *Ec*, ecsoma; *Esv*, external seminal vesicle; *Ex ap*, excretory aperture; *Ex v*, excretory vesicle; *Gc*, genital cone; *Gp*, genital pore; *Hd*, hermaphrodite duct; *Int*, intestine; *I sv*, internal seminal vesicle; *Lc*, Laurer's canal; *Oc*, ocular pigment; *Oo*, ootype; *Oes*, oesophagus; *OS*, oral sucker; *Ov*, ovary; *P gl*, prostate gland; *Ph*, pharynx; *Pp*, pars prostatica; *P ph*, prepharynx; *Rs*, receptaculum seminis; *R su*, receptaculum seminis uterinum; *Sh gl*, shell gland; *S ph*, sphincter; *Ss*, sinus sac; *Sv*, seminal vesicle, *Tes*, testis; *Ut*, uterus; *Vas d*, vas deferens; *VS*, ventral sucker or acetabulum; *Yk d*, yolk duct; *Yk gl*, yolk gland; *Yk r*, yolk reservoir.

This contribution to our sparse knowledge of the helminth fauna of Tasmanian Fishes reports the presence of eight Trematodes, four of which are regarded as new. Apart from the taxonomic and morphological aspects, considerable interest accrues from a consideration of the significance of the presence of these particular species in Tasmanian waters.

Virtually nothing is known of the composition and distribution of the Trematode fauna of the fishes of the antarctic and southern temperate regions. Manter (1934) observes that many of the trematodes taken from deep-water fishes at Tortugas find their closest relatives in the fishes of Northern and far-distant waters rather in those of nearby shallow waters. Further, Manter remarks, 'It might even be found eventually that some species of trematodes have a continuous distribution from Arctic to Antarctic through deep-water hosts, although their shallow-water hosts might only appear in distant waters. Trematodes of the Antarctic are practically unknown and their comparison with deep-water forms of the tropics would be most interesting'.

The present paper, although limited in scope, bears out Manter's contention, e.g., *Helicometra fasciata*, herein reported from Tasmania, has been reported from both European and tropical waters. Again, *Hemiperina manteri* n.sp. finds its closest relative *(Hemiperina nicolli)* in deep waters at Tortugas, and the two members of the closely related genus *Hemipera* occur in British waters. *Derogenes crassus* has previously only been reported from deep waters at Tortugas. The occurrence of a new species of *Bivesicula* is of special interest as the three known species of this genus occur in Japanese waters. We may well expect the genus to have a continuous distribution from Northern to Southern hemispheres through the medium of deep-water tropical hosts.

Family ALLOCREADIIDAE

Sub-family *Allocreadiinae*

Helicometra fasciata (Rud.)

(Fig. 1)

Host: Neosebastes thetidis Waite.
Location in Host: Intestine, immediately beyond stomach.
Locality: Host obtained from Hobart fish market.
Frequency: Six specimens in one of six host fish examined. (March, 1945.)

Principal Dimensions

	Length mm.	Breadth mm.	Forebody mm.	Oral sucker mm.	Ventral sucker mm.	Eggs μ
1.	2·04	0·85	0·93	0·16	0·29	64 x 28
2.	2·49	1·09	0·99	0·19	0·36	88 x 28
3.	2·56	1·06	0·83	0·18	0·37	62-72 x 24
4.	2·79	1·08	1·11	0·19	0·36	72-88 x 24-28
5.	2·79	1·12	1·16	0·19	0·39	72-80 x 28-36
6.	3·63	1·45	1·58	0·28	0·46	88 x 28

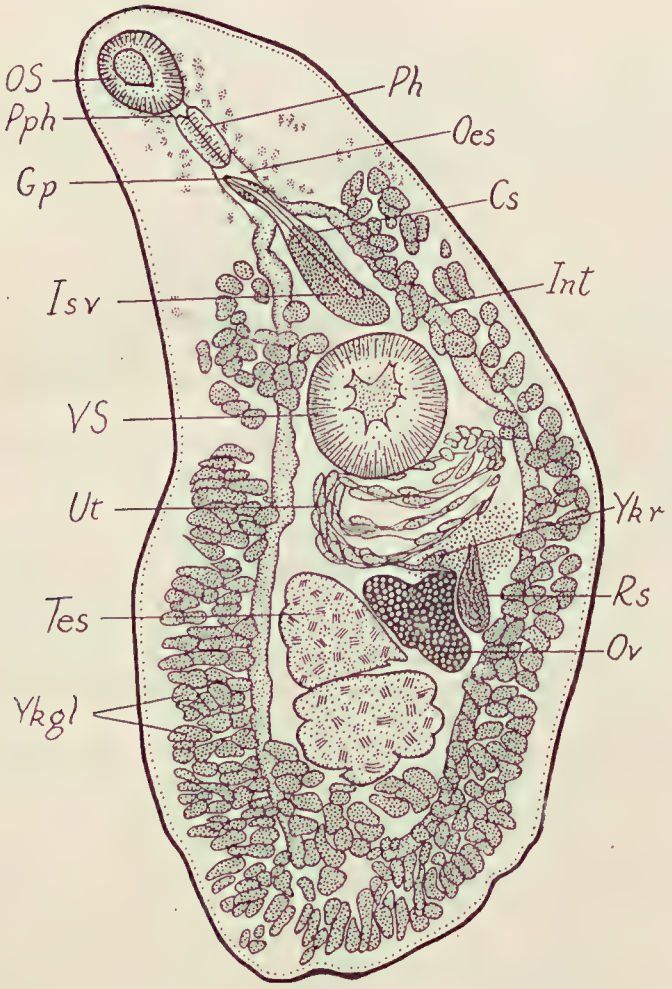


FIG. 1.—*Helicometra fasciata*, whole mount from the ventral aspect.
(For abbreviations used on figures, see beginning of paper.)

Minor differences occur between these specimens and descriptions of forms taken from different fishes in other regions, but there seems every reason to include them in *H. fasciata*. This species is one of the most widely distributed of digenetic trematodes, having been previously reported from the Atlantic and Mediterranean Oceans, Tortugas, Florida, and Mexico. This is the first record of its occurrence in Southern waters. Its presence here is of interest as its occurrence is now known to be from distant Northern to Southern waters, in cold and in tropical seas over a wide range of longitude.

Helicometra bassensis Woolcock

(Fig. 2)

Host: Platycephalus bassensis.
Location in host: Intestine.
Locality: Derwent Estuary.
Frequency: Four specimens in one fish examined. (Feb., 1945.)

Principal Dimensions

	Length mm.	Breadth mm.	Forebody mm.	Oral sucker mm.	Ventral sucker mm.	Eggs μ
1.	2·17	0·36	0·72	0·19	0·28	60 x 28
2.	2·25	0·51	0·47	0·21	0·34	56 x 28
3.	2·59	0·49	0·68	0·23	0·33	60 x 28
4.	3·31	0·56	0·83	0·24	0·37	60-70 x 28

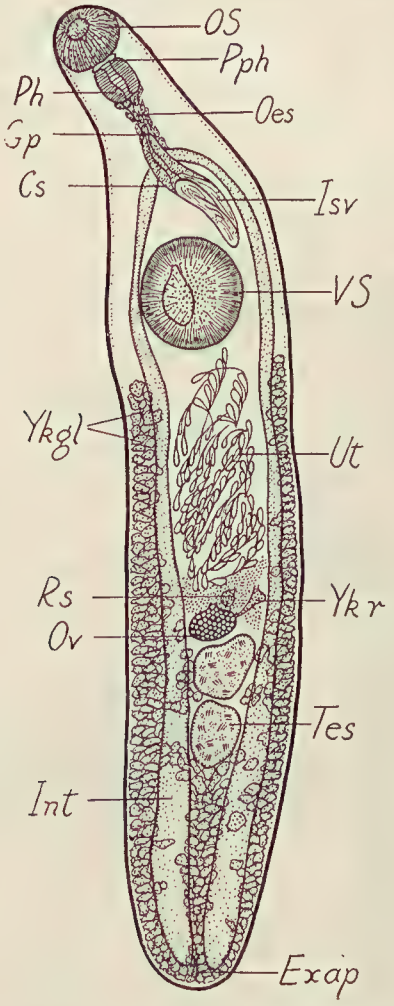


FIG. 2.—*Helicometra bassensis*, whole mount from the dorsal aspect.

There is no doubt that these trematodes represent *Helicometra bassensis*, but the specimens are worthy of note as the body is more slender and the testes are proportionately smaller than in Woolcock's specimens. The host is the same as that in which this species occurs in Victorian waters.

Family OPECOELIDAE

Sub-family *Opecoelinae*

Opecoelus tasmanicus n.sp.

(Figs 3-5)

Host: Latridopsis forsteri Castelnau.
Location in Host: Rectum.
Locality: Host obtained from Hobart fish market.
Frequency: Eight specimens from one of two hosts examined. (March, 1946.)

Principal Dimensions

	Length mm.	Breadth mm.	Forebody mm.	Oral sucker mm.	Ventral sucker mm.	Eggs μ
1.	2·74	0·86	0·73	0·24	0·39	—
2.	2·99	0·77	0·83	0·24	0·39	52 x 32
3.	3·34	0·86	1·06	0·27	0·42 x 0·39	60 x 32

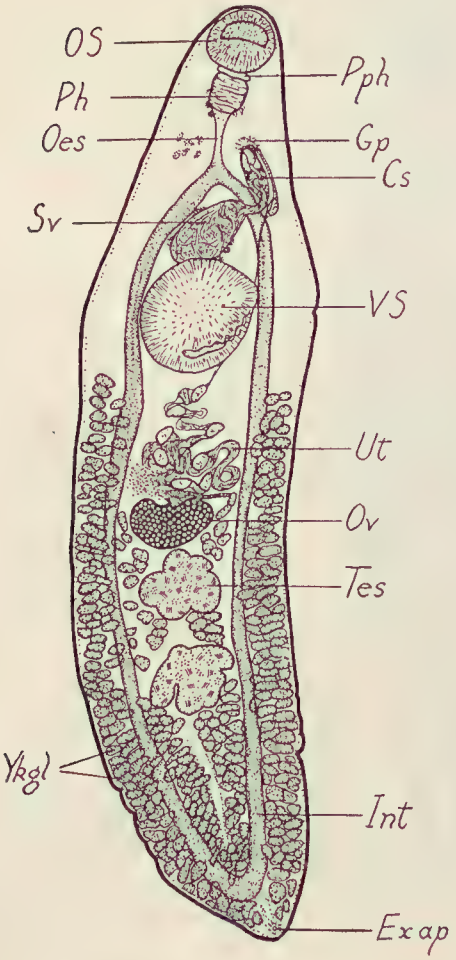


FIG. 3.—*Opecoelus tasmanicus*, n. sp., whole mount from the ventral aspect.

External features: The elongate body is broadest at the level of the testes. It tapers sharply towards the anterior end and is bluntly roundly tapered posteriorly. In section the worms are quite flat. The oral sucker is sub-terminal and is not preceded by a lip. The ventral sucker is situated at the junction of the first and middle thirds of the body length. It is slightly elongated transversely and opens by a transverse aperture, the lips of which are produced into five or six blunt papillae. The ventral sucker is not pedunculate. In this respect it differs from most species of Opecoelus. The common genital aperture is situated to the left of the oesophagus mid-way between the pharynx and the intestinal fork. The excretory pore is at the posterior tip of the body. A further aperture, the anus, occurs on the ventral surface just anterior to the excretory pore. The cuticle is smooth and spineless.

Alimentary System: The oral sucker is separated from the pharynx by a short thin-walled prepharynx. The pharynx measures 0·14 mm. long by 0·09 mm. in diameter, and is followed by a muscular oesophagus leading to the intestinal fork. The cuticle does not appear to extend into the gut beyond the pharynx. The two rami diverge and run backwards on either side of the body some little distance from the lateral margins. Posteriorly they unite into a continuous arc which runs parallel with the posterior border of the body. A blunt caecum from the middle of the posterior arc passes backwards to meet an invagination of the body wall forming a connecting tube between the intestine and the anus. The gut wall lacks conspicuous muscle fibres and is lined throughout by a flattened epithelium containing numerous ovoid nuclei.

Excretory System: There is a median excretory bladder which extends forwards as far as the ovary, lying dorsal to the testes. Anteriorly the vessel gives off a pair of slender vessels which diverge and run forward below the gut rami into the neck region.

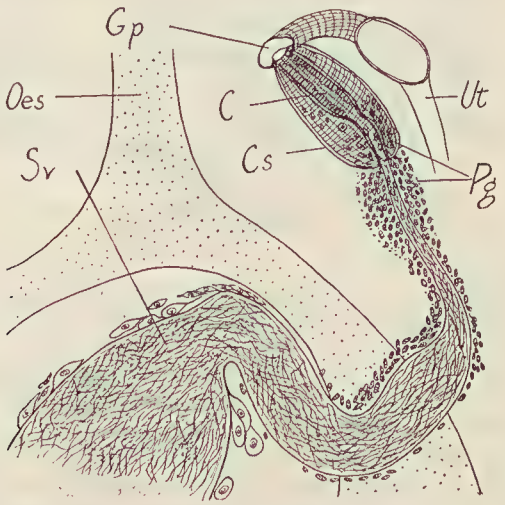


FIG. 4.—*Opecoelus tasmanicus*, n. sp., details of male terminal organs.

Reproductive System: i. *Male:*—The two testes are irregularly rounded lobed bodies lying one behind the other, between the rami, in the third quarter of the body length. They are elongated transversely and measure from 0·27 x 0·21 mm. to 0·52 x 0·39 mm. The anterior testis lies immediately behind the ovary and is

separated from the second by a short space which may be occupied to a more or less degree by yolk follicles. The vasa deferentia arise on the anterior borders of the testes and run forward above the ovary into the uterine region. They pass over the ventral sucker side by side and enter the base of the seminal vesicle. In the "in toto" mounts the vesicle lies obliquely in front of the ventral sucker, but in the contracted uncompressed specimens sectioned, the vesicle is seen to lie in the mid-line and to extend backwards for a considerable distance above the ventral sucker. The vesicle has the form of an elongated sac which tapers anteriorly as it crosses the left ramus of the gut and enters the cirrus sac. The size of the seminal vesicle varies greatly in different individuals. Very prominent gland cells which are highly vacuolate, are clustered about its thin wall. The cirrus sac measures about 0·14 mm. long and 0·06 mm. in diameter. It is quite muscular, possessing stout outer longitudinal and inner circular fibres. The tubular extension of the seminal vesicle lying within the sac leads into the pars prostatica. This portion of the male duct is short and is lined by the typical tall empty-looking cells. It receives the fine protoplasmic threads from the surrounding prostate gland which contains comparatively few darkly-staining nuclei and lies mainly outside the cirrus sac. The pars prostatica is followed by the terminal portion of the male duct approximately 0·05 mm. long which is slightly thickened and constitutes an unarmed cirrus. This leads into a short common genital atrium leading to the ventral surface.

FIG. 5.—*Opecoelus tasmanicus*, n. sp., diagram of female genital complex reconstructed from transverse sections.

ii. *Female:*—The ovary is a compact kidney-shaped body lying directly in front of the anterior testis with its long axis directed transversely. In four "in toto" mounts the ovary measures approximately 0·30 x 0·15 mm. The oviduct leaves the ovary at the middle of its antero-dorsal surface, runs backwards and gives off Laurer's canal. This winds a sinuous course forwards and upwards and opens through the cuticle in the mid-line above the ovary. The canal contains masses of sperms in one specimen sectioned. After giving off Laurer's canal the oviduct expands into the ootype. This receives innumerable protoplasmic threads from the cells of the shell gland. The gland is well-developed and diffuse, extending right across the intercaecal space in front of the ovary. The gland cells are large and well defined, each containing a prominent nucleus and darkly-staining vacuolate cytoplasm. The female duct receives a short yolk duct from the yolk reservoir and

passes into the thin-walled uterus. Sperms may be present throughout the entire length of the uterus but the proximal loops consistently contain spermatic fluid and function as a receptaculum seminis. The convuluted uterus fills the intercaecal space between the ventral sucker and the ovary. It passes over the ventral sucker near the mid-line, and forwards along the left side of the seminal vesicle. The terminal portion of the uterus is muscular and may be distinguished as a metraterm. This opens into the common genital atrium in front of the male opening. The eggs are relatively large and thin-walled, possessing a circular operculum 12 μ in diameter. They are roundly ovoid in form and yellow in colour.

The vitellaria are small ovoid and irregularly formed follicles occupying the space between the lateral body margins and the gut rami. They are continued around the posterior arch of the gut and the intercaecal space in the vicinity of the ovary and the testes is largely filled by them. The yolk cells are collected by lateral yolk ducts which lie below the gut rami. Just in front of the ovary transverse ducts unite to form the central yolk reservoir. This tapers into a short duct which opens into the female duct. The vitellaria do not extend forwards beyond the posterior border of the ventral sucker.

Discussion: Opecoelus tasmanicus n.sp. seems most closely related to *O. mexicanus* Manter, from which it differs in its larger size and in the nature of the papillae of the ventral sucker. The seminal vesicle does not extend posterior to the ventral sucker in whole mounts and extended specimens. In this respect *O. tasmanicus* resembles those species placed in the genus Opegaster. However the vitellaria are entirely post-acetabular, and the glands present in the forebody do not appear to be concerned with the production of yolk. As Manter (1940) points out, the genera *Opecoelus* and *Opegaster* are very similar. It seems evident that the extent of the seminal vesicle and the vitellaria are unsatisfactory reasons for separating the genera. The tendency to raise minor differences to the rank of important diagnostic characters has long been exhibited by some writers on this group. The preferable course would seem to be the grouping of such similar species into one genus until such time as sufficiently clear sub-groups appear to warrant the setting up of several genera.

Family HEMIURIDAE

Sub-family *Derogenetinae*

Derogenes crassus Manter

(Figs 6-7)

Host: Physiculus barbartus Günther.

Location in Host: Gall bladder.

Locality: Hosts obtained from Hobart fish market.

Frequency: Seven specimens in one host (July, 1945). Absent from many hosts examined previously and since that date.

Principal Dimensions

	Length mm.	Breadth mm.	Forebody mm.	Oral Sucker mm.	Ventral Sucker mm.	Eggs μ
1.	3·44	1·12	1·50	0·37	0.81 x 0·75	64 x 28-32
2.	3·21	1·03	1·29	0·34	0·75 x 0·75	58-64 x 30-32
3.	2·85	0·93	1·17	0·34	0·67 x 0·67	60-64 x 28-32

The principal dimensions of three mounted specimens are given in the above table. The four remaining specimens were embedded and sectioned. Unfortunately the hard thick shells of the innumerable eggs which occupy most of the body prevented the preparation of successful serial sections.

Manter (1934) describes *Derogenes crassus* from a single mounted trematode which he regards as presenting sufficient differences from known species to warrant the formation of a new one. The present specimens are slightly larger than Manter's specimen but resemble it closely in proportion, the disposition of the internal organs and in the size of the eggs. There appears to be a difference in the form of the vitellaria, those of my specimens being roundly lobed, while those of Manter's specimen are described as compact and unlobed.

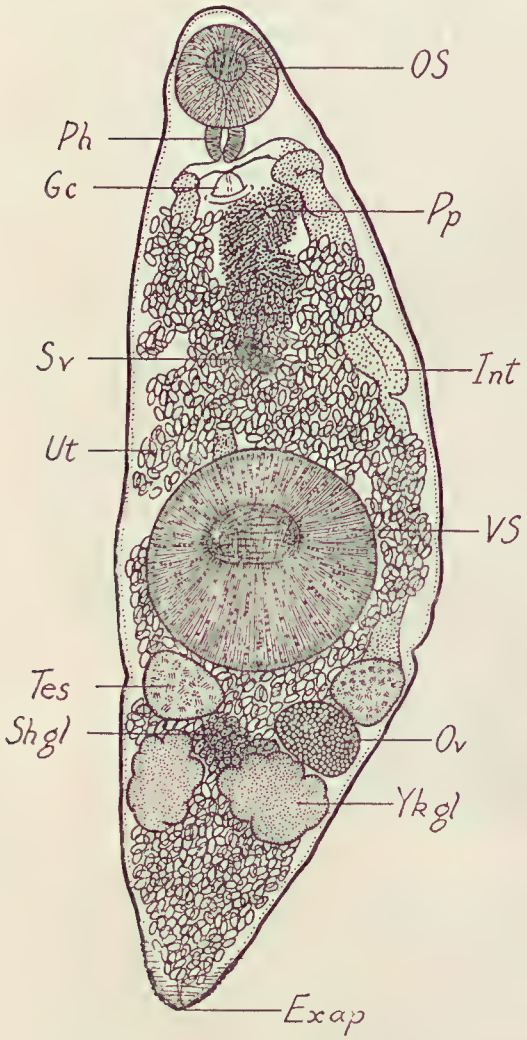


FIG. 6.—*Derogenes crassus*, whole mount from the ventral aspect.

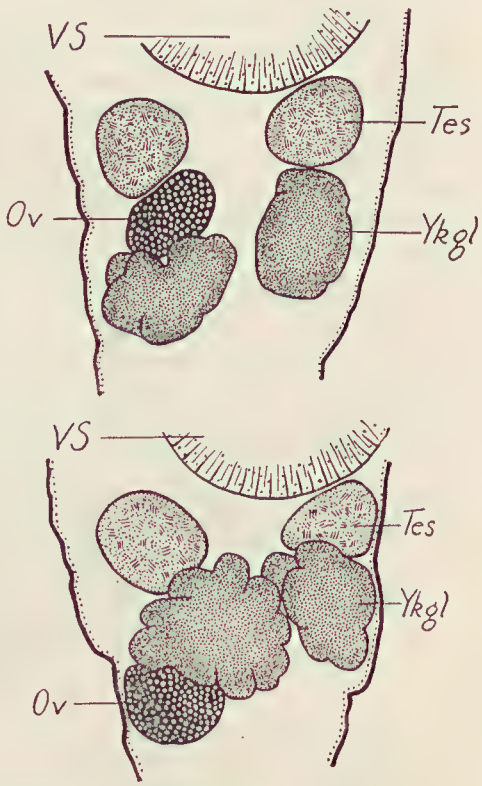


FIG. 7.—*Derogenes crassus*, sex glands of two specimens, both from the ventral aspect.

It is possible that a more detailed examination of the deep-water form from Tortugas, and of the Tasmanian form may reveal specific differences, but in view of the inadequate material available it seems quite advisable to include my specimens in *Derogenes crassus*. Slight displacement of the organs often occurs in the mounting of stout trematodes. This accounts for the variation in the relative positions of the ovary and vitellaria shown by the three mounted specimens (Fig. 7). The occurrence of the ovary on the left side in one specimen may not be due to displacement, but may represent a variation within the species.

Sub-family *Hemiurinae*

Parahemiurus lovettiae n.sp.

(Figs 8-9)

Host: Lovettia sealii Johnston ("White Bait").
Location in Host: Intestine.
Locality: Huon Estuary.
Frequency: One to three specimens in four of twelve hosts examined.

Principal Dimensions

	Length	Breadth	Fore-body	Oral Sucker	Aceta-bulum	Testes	Ovary	Eggs
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	μ
1.	1·21 + 0·25	0·29	0·18	0·08	0·15	0·13 x 0·098	0·13 x 0·08	20 x 8
2.	1·19 + 0·23	0·36	0·28	0·08	0·15	0·13 x 0·098	0·15 x 0·08	20 x 8
3.	1·27	0·39	0·16	0·08	0·15	0·098	0·114 x 0·065	20 x 8
4.	0·85 + 0·34	0·285	0·17	0·089	0·15	0·08	0·098 x 0·065	20 x 8
5.	0·91 + 0·23	0·28	0·10	0·08	0·15	0·114	0·13 x 0·08	21 x 9

External features: The body is slender and cylindrical, tapering towards the anterior end. Posteriorly the body is produced into a tapered "tail" or ecsoma, which is capable of complete withdrawal into the body. The ecsoma makes up approximately a quarter of the animal's total length. The oral sucker is terminal, its aperture being only slightly directed towards the ventral surface. The ventral sucker is situated approximately at the junction of the first and second fifths of the body length. The ratio between the suckers is 1 : 1·875. The excretory pore is at the tip of the ecsoma. The cuticle is produced into the prominent rings or plications, characteristic of the group. They extend laterally and ventrally for the full length of the soma, becoming gradually more separated towards the posterior end. They do not extend to the ecsoma. Dorsally the plications extend completely across the body beyond the level of the ventral sucker, but appear to be lacking beyond the level of the anterior testis.

Alimentary System: The oral sucker opens directly into the pharynx. This is spherical and measures 0·05 mm. in diameter. The pharynx leads into a globular muscular oesophagus or oesophageal pouch. Posteriorly the wall of the oesophagus is thickened to form a sphincter through which the oesophagus communicates with the two gut rami. The proximal portions of the rami are unlined and run directly transversely. The rami then turn sharply backwards and expand into thin-walled sinuous tubes, which are lined by an epithelium of closely-packed tall cells with basal nuclei. The cuticle does not appear to extend into the gut beyond the pharynx. The rami continue backwards lying dorsal to the ovary and vitellaria and enter the ecsoma, in some cases extending almost to the tip of the tail. The gut wall is very weakly muscular.

Excretory System: This species presents no variation from the typical system of the family. A single tubular vesicle penetrates the ecsoma and bifurcates approximately at the level of the testes. The branches diverge and pass forwards and towards the dorsal surface, fusing to form a continuous loop above the pharynx.

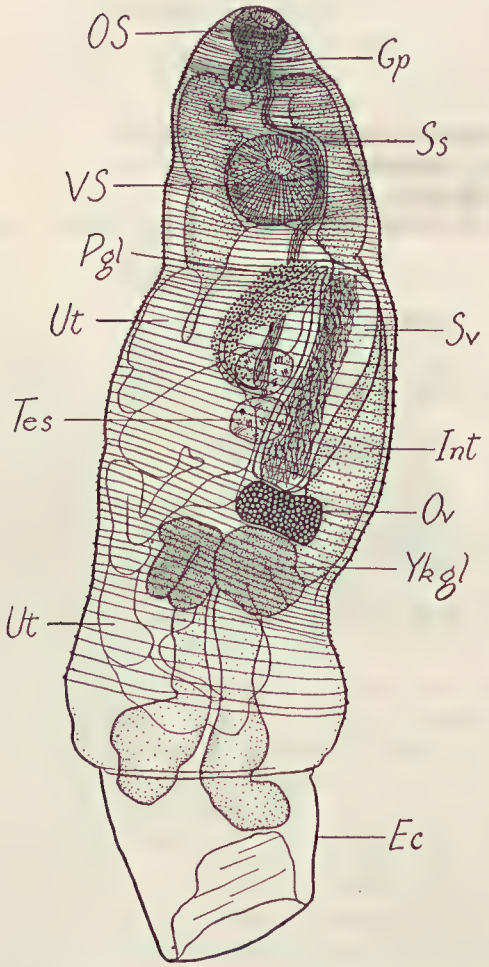


FIG. 8.—*Parahemiurus lovettiae*, n. sp., whole mount from the ventral aspect.

Reproductive System: i. *Male:*—The two testes are ovoid unlobed bodies lying directly or slightly obliquely in tandem in the middle region of the body. In all specimens examined the testes are in contact, never separated by loops of the uterus. The relative size of the testes varies somewhat in different individuals but they are always smaller than the ventral sucker and in most specimens, smaller than the ovary. The vasa deferentia are very short as they pass directly to the base of the seminal vesicle which may be to the right of the testes or directly dorsal to them. The vesicle is a large spindle-shaped muscular sac which extends obliquely forwards from the vicinity of the posterior testis to a point mid-way between the anterior testis and the ventral sucker, or almost to the posterior border of the latter. The seminal vesicle measures 0·2-0·3 mm. in length and 0·05-0·08 mm. in diameter at its middle length. The wall is extremely thick, the lumen measuring 0·032 mm. in diameter in the transverse section of a vesicle 0·08 mm. in diameter. As is the case in the other species placed in this genus the lumen is undivided. At its anterior extremity the vesicle tapers into a slender muscular duct which turns backwards and expands slightly forming a long pars prostatica 0·022 mm. in

diameter. The prostate gland consists of numerous individual small vacuolate cells which have prominent nuclei, clustered uniformly around the pars prostatica throughout its length. The prostate cells are not enclosed by any limiting membrane, and they become sparser posteriorly finally petering out. The male duct then meets and fuses with the narrow terminal portion of the female duct, forming the long narrow hermaphrodite duct which passes directly forwards over the ventral sucker, through the neck region to the genital pore. Throughout its entire length the duct is enclosed by a strongly muscular sinus sac which is separated from the duct by a narrow space. It seems certain that the terminal portion of the hermaphrodite duct functions as the copulatory organ, as Woolcock (1935) observes in the case of *P. australis.*

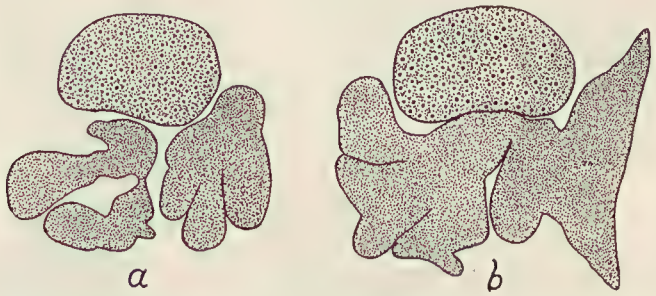


FIG. 9.—*Parahemiurus lovettiae,* n. sp., female glands of two specimens, "a" ventral view, "b" dorsal view.

ii. *Female:* The ovary is a smooth ovoid body situated towards the left side of the animal mid-way between the ventral sucker and the posterior end of the soma. In most specimens it is in contact with the posterior testis but it may be separated from that organ by loops of the extensive uterus. The ripe egg-cells measure 8 μ in diameter. The vitellaria are two adjacent lobed bodies lying immediately behind the ovary. In form they may be roundly bilobed or somewhat more divided (Fig. 9). The material is not favourable for the detailed examination of the course of the oviduct and vitelline ducts. However, the ootype lies immediately behind the ovary in a position dorsal to the vitellaria, and is surrounded by small cells with densely-staining contents, which constitute the shell gland. A small receptaculum seminis is present beside the shell gland. The uterus runs back into the ecsoma and then turns forward and fills most of the body spaces behind the ventral sucker. It is voluminous and contains very numerous elongate-ovoid eggs, which are light-brown in colour. The uterus narrows abruptly before fusing with the male duct to form the hermaphrodite duct or genital sinus.

Discussion: Since the genus *Parahemiurus* was erected by Vaz & Pereira (1930), with *P. parahemiurus* as the type, ten species have been added. Of these Manter (1940) recognizes only six, regarding *P. parahemiurus, P. platichthyi, P. atherinae,* and *P. harengulae* as synonyms of *P. merus* (Linton), and retaining *P. merus, P. australis, P. anchoviae, P. sardinae, P. seriolae,* and *P. ecuadori.* The species described above closely resembles *P. australis* in the form and proportions of the body, in the shape of the seminal vesicle, which in this species at least, does not appear to be variable, and in the size of the eggs. However, the body and all organs are markedly smaller and it differs from *P. australis* in the greater extent of the plications of the cuticle. The diagnostic value of the latter character is

generally accepted, but it is sometimes difficult to ascertain the extent with certainty and published descriptions are not always clear on this point. Until workers are agreed on the relative diagnostic importance of morphological characters in the Trematoda, and until the extent of the effects of different hosts and conditions upon a species are understood, the recognition of individual species of *Parahemiurus* will remain controversial. However, there is a sufficiently clear group of related species with sufficiently marked individual differences to ensure the survival of this genus.

Parahemiurus australis Woolcock

(Fig. 10)

In a previous paper (Crowcroft, 1946), the writer pointed out the presence of a Hemiurid which appeared to be *Parahemiurus australis*, in the stomach of the 'Rock Cod', *Physiculus barbartus* Günther. The principal dimensions of the specimens are given here for purposes of comparision with those of the preceding species. An illustration of a whole mount is given for the convenience of local students.

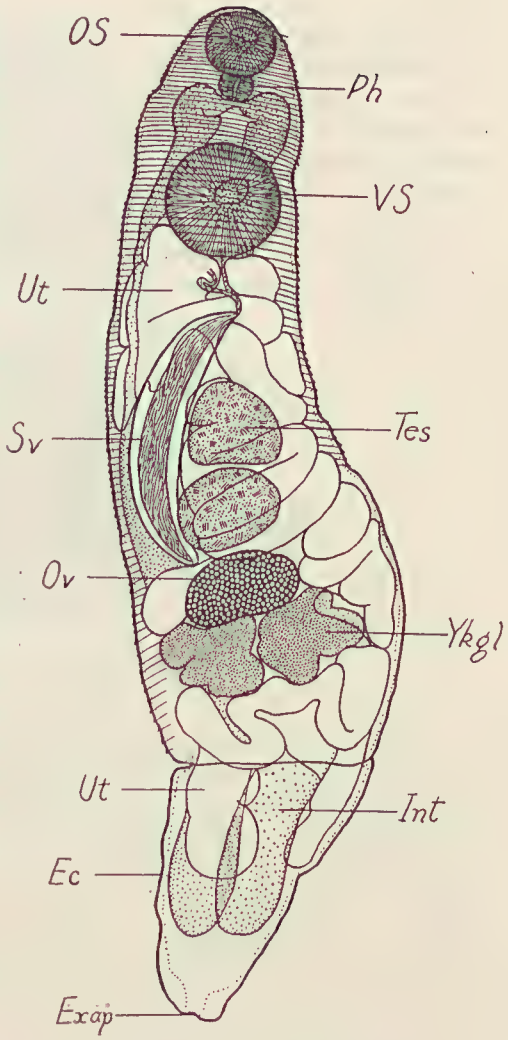


FIG. 10.—*Parahemiurus australis*, whole mount from the dorsal aspect.

Principal Dimensions

	Length	Breadth	Fore-body	Oral Sucker	Aceta-bulum	Testes	Ovary	Egg
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	μ
1.	1·83 + 0·44	0·51	0·29	0·15	0·28	0·23 x 0·15	0·28 x 0·13	20 x 8
2.	1·68 + 0·52	0·72	0·34	0·18	0·32	0·18 x 0·11	0·26 x 0·15	24 x 8
3.	1.66 + 0·41	0·52	0·39	0·18	0·29	0·19 x 0·11	0·26 x 0·13	20 x 8
4.	1·55 + 0·42	0·46	0·29	0·13	0·24	0·13	0·20 x 0·12	22 x 6
5.	1·38 + 0·52	0·54	0·27	0·16	0·25	0·23 x 0·16	0·24 x 0·13	22 x 8

Hemiperina manteri n.sp.

(Figs 11-12)

Hosts: 1. *Latridopsis forsteri* Castelnau ("Bastard trumpeter").
2. *Cheilodactylus spectabilis* Hutton ("Carp").

Location in Host: Stomach.

Locality: Hosts obtained from Hobart fish market.

Frequency: Twenty-one specimens in the first host and two specimens in the second. (March, 1946.)

External features: The body is elongate, and almost round in section being only slightly flattened ventrally. The thick cuticle is unspined and smooth. The body is broadest at the level of the ventral sucker which is situated at the junction of the second and last thirds of the body length. In front of the ventral sucker the body tapers gradually to the bluntly rounded anterior end. Posteriorly the body tapers strongly. The oral sucker is surmounted by a fleshy pre-oral lip. The principal dimensions of nine mounted specimens are given in the following table. Specimens 5 and 6 are those taken from the second host mentioned above.

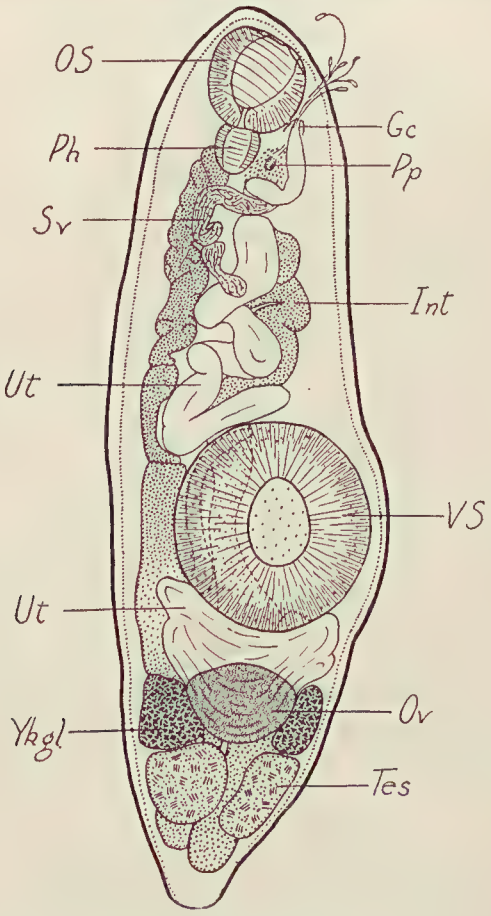


FIG. 11.—*Hemiperina manteri*, n. sp., whole mount from the ventral aspect.

Principal Dimensions

	Length	Breadth	Forebody	Oral Sucker	Ventral Sucker	Eggs
	mm.	mm.	mm.	mm.	mm.	μ
1.	2·07	0·68	0·93	0·24	0·50	32 x 12
2.	2·10	0·79	1·03	0·24	0·46	32 x 12
3.	2·23	0·64	1·08	0·26	0·46	32 x 12
4.	2·44	0·81	1·11	0·29	0·62	32 x 12
5.	2·51	0·81	1·16	0·27	0·52	32 x 12
6.	2.62	0·81	1·45	0·29	0·55	32 x 12
7.	2·62	0·83	1·24	0·29	0·60	36 x 12
8.	2·67	0·78	1·35	0·31	0·59	32 x 12
9.	3·01	0·70	1·47	0·28	0·55	40 x 8-12

The common genital aperture is situated at the end of a protusible genital cone, which is median in position, a short distance behind the oral sucker. The excretory aperture is a simple pore at the posterior extremity.

Digestive System: The oral sucker is applied to the pharynx postero-dorsally, a prepharynx being absent. The pharynx is slightly longer than its diameter, measuring 0·114 mm. x 0·08 mm. Posteriorly it opens into a short oesophagus whose wall is thinly muscular consisting of inner circular and outer longitudinal fibres. At its junction with the pharynx, the oesophagus is narrow but it rapidly expands into the oesophageal pouch frequently seen in this family. The oral sucker, pharynx and oesophagus are lined by an internal extension of the cuticle. The gut rami arise from the dorsal wall of the oesophageal pouch. A proximal portion of each ramus is smooth and unlined and runs directly outwards from its origin. The rami then turn backwards and pass through the long forebody. They lie some distance from the body margins and enclose the uterus. They pass over the ventral sucker lying closely together, diverge behind that organ to encompass the shell gland and continue backwards side by side almost to the posterior end of the body. Throughout their length the rami are lined by large collumnar cells containing prominent nuclei. These cells are somewhat separated from one another and impart a speckled appearance to the rami of the stained "in toto" mounts. The actual wall of the gut is membranous and apparently lacks distinct muscle fibres.

Excretory System: The posterior, single median portion of the excretory vesicle is quite short bifurcating behind the level of the vitellaria. The two arms run forward side by side to about the level of the ovary. They then diverge and come to lie beneath the gut rami. In this position the paired canals run forward throughout the forebody. Anteriorly they pass towards the dorsal surface and are seen to be continuous with one another above the pharynx.

Reproductive System: i. *Male.*—There are two roundly triangular entire testes lying almost side by side in the posterior fifth of the body. In specimens 5 and 6 of the above table the testes measured 0·26 x 0·21 and 0·13 x 0·24 and 0·19 x 0·29 respectively, but they were either lacking or partially disintegrated in the specimens taken from *Latridopsis forsteri.* The testes lie immediately behind the vitellaria, and when fully developed their posterior border is but a short distance in front of the termination of the gut rami. The fine vasa deferentia were not completely traced forwards but were seen to unite at the base of the seminal vesicle mid-way between the suckers. The seminal vesicle takes the form of a sinuous tube 0·05 mm. in diameter which runs forward almost to the bifurcation of the gut. Its wall is membranous and contains widely-scattered flattened nuclei. At its anterior end the vesicle narrows abruptly into a duct which runs forward and downwards and opens through a sphincter into the pars prostatica. This measures 0.018 mm. in

diameter. The lumen is very narrow due to the lining of tall empty-looking cells. The pars prostatica and the narrow portion of the seminal vesicle leading to it are surrounded by the numerous cells which constitute the well-developed diffuse prostate gland. Fine protoplasmic threads radiate backwards and outwards from the wall of the pars prostatica to the vacuolate prostate cells. The pars narrows and passes through the somewhat diffuse meridional muscles which must be regarded as constituting a sinus-sac. The typical prostatic lining is lost and when the male duct penetrates as far as the centre of the sinus-sac, it receives the metraterm posteriorly, forming the genital sinus or hermaphrodite duct. The sinus-sac measures 0·068 mm. in diameter and appears to be responsible for the eversion of the genital cone through which the hermaphrodite duct passes to the genital aperture situated at its extremity.

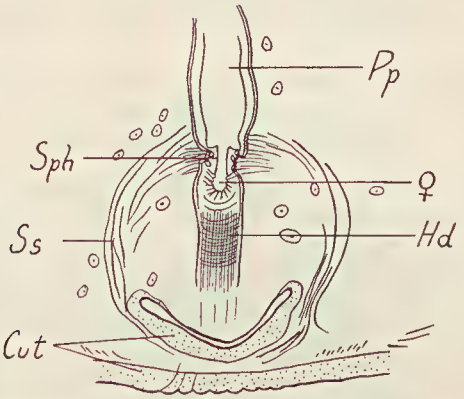


FIG. 12.—*Hemiperina manteri*, n. sp., portion of a transverse section showing junction of male and female ducts.

ii. *Female:* The ovary is situated a short distance in front of the testes in a median position. It is globular and in specimens mounted under cover-glass pressure appears transversely elongated measuring 0·098-0·19 x 0·16-0·29 mm. The nuclei in the ovary measure 0·008 mm. in diameter. Dorsally the ovary passes into a narrow oviduct which runs directly dorsal for a short distance. It then turns abruptly and receives Laurer's canal. This runs forward sinuously for a short distance and opens on the dorsal surface, in the mid-line. The canal is slightly dilated a short distance from its origin and may function as a receptaculum seminis. Laurer's canal measures 0·015 mm. in diameter but is lined by a thick non-staining layer which leaves only a narrow lumen. A very short distance from its junction with Laurer's canal the oviduct receives a short narrow yolk duct from the central yolk reservoir, and enters the compact shell gland. The latter is globular and measures 0·09 mm. in diameter. The numerous cells of the gland display abundant contents and prominent nuclei. Within the shell gland the female duct runs backwards, describes a complete turn and runs antero-ventrally as the ootype.

The vitelline glands are two entire ovoid bodies lying on either side of the ovary and extending slightly beyond that organ posteriorly. They are approximately equal in size measuring about 0·16 x 0·11 mm. and vary only slightly in form in the mounted specimens. The glands are bounded by thin membranous

walls and are loosely packed with yolk cells. The cells contain yolk particles and large spherical nuclei each with a single prominent nucleolus. A yolk duct leaves each gland on its innermost surface and runs obliquely dorsally between the ovary and the gut. They unite into a fairly large yolk reservoir dorsal to the ovary and immediately behind the origin of the oviduct.

After leaving the shell gland the female duct expands slightly into the uterus. This describes many loops and below and in front of the ovary forms a compact mass which extends forward to the ventral sucker. The uterus then passes over the ventral sucker between the gut rami and describes a helical spiralled course to the level of the prostate gland. Here it narrows into a muscular metraterm 0·028 mm. in diameter which runs forwards and downwards and penetrates the sinus-sac. It opens through a stout sphincter into the common genital sinus which measures 0·024 mm. in diameter and 0·06 mm. long when the genital cone is retracted. The first loops of the uterus contain numerous sperms and function as a uterine seminal receptacle.

The innumerable eggs are light-brown in colour. They are elongate, bearing a bluntly-rounded operculum in front and at the other end tapering into a very long slender filament which is many times longer than the body of the egg.

Discussion: The genus Hemiperina was set up by Manter (1934) for a single species, *Hemiperina nicolli.* Manter did not include this species in the genus *Hemipera* Nicoll "because of the evident lack of a cirrus sac, absence of a seminal receptacle, better prostate gland and much smaller eggs." The species described above is identical in size with *Hemiperina nicolli* and closely resembles it in structure, The chief differences are in the form of the seminal vesicle and the presence in *Hemiperina manteri* of a weakly-developed sinus-sac. The genus *Hemipera* Nicoll contains two species *H. ovocaudata* Nicoll and *H. sharpei* Jones. The four allied species are compared in the following table:—

	Hemipera ovocaudata	*H. sharpei*	*Hemiperina nicolli*	*H. manteri*
Host	*Lepadogaster gounnaii*	*Cepola rubescens*	*Chaunax nuttingi Diplacanthopoma brachysoma Dibranchus atlanticus*	*Latridopsis forsteri Cheilodactylus spectabilis*
Location in Host	Stomach	Under Gill-cover	Stomach	Stomach
Length mm.	1·54 x 0·56	4·77 x 0·85	2·07-3·13 x 0·72-0·87	2·07-3·01 x 0·68-0·83
Oral Sucker	0·22 mm.	0·37 mm.	ratio 2 : 3 or 3 : 4	0·24-0·31 mm.
Ventral Sucker	0·4 mm.	0·74 mm.	ratio 2 : 3 or 3 : 4	0·46-0·62 mm.
Termination of male duct	Cirrus-sac present containing prostate gland. Vesicula seminalis externa present	Cirrus-sac present, probably contains prostate gland, and seminal vesicle	Cirrus-sac absent. Well-developed free prostate gland and seminal ves. present. Vesicle sac-shaped and muscular	Sinus-sac weakly developed. Well-developed free prostate gland and seminal ves. present. Ves. tubular, thin-walled
Female Complex	No distinct receptaculum sem. Laurer's canal 'apparently absent'	Prominent receptac. sem. present. Laurer's canal present	Receptac. sem. uterinum present. Laurer's canal not described	Receptac. sem. uterinum present. Laurer's canal present
Eggs	μ 100 x 27 with short filaments	100 x 38 with filaments about 11 times egg length	44-52 x 16-20 with filaments at least 20 times egg length	32-40 x 8-12 with filaments at least 20 times egg length

Although a weakly-developed sinus-sac is present in *Hemiperina manteri* this structure does not correspond to the cirrus-sac of *Hemipera* but is parallel rather with the sinus-sac of *Thelctrum.* The generic diagnosis of *Hemiperina* must therefore be amended to include forms in which a sinus-sac is in evidence.

Family BIVESICULIDAE

Bivesicula australis n.sp.

(Figs 13-15)

Host: Neosebastes thetidis Waite.

Location in Host: Intestine, near stomach.

Locality: Hosts obtained from Hobart fish market.

Frequency: One in each of three hosts, two in one host, absent from four others examined (December, 1944; March, 1945).

Principal Dimensions

	Length mm.	Breadth mm.	Oral Sucker mm.	Ovary mm.	Testis mm.	Eggs μ
1.	1·59	0·62	0·15	0·15	0·24 x 0·29	84 x 48
2.	2·51	1·04	0·31	0·13 x 0·16	0·41	60 x 44
3.	2·54	1·17	0·26	0·19	0·39 x 0·41	72 x 48

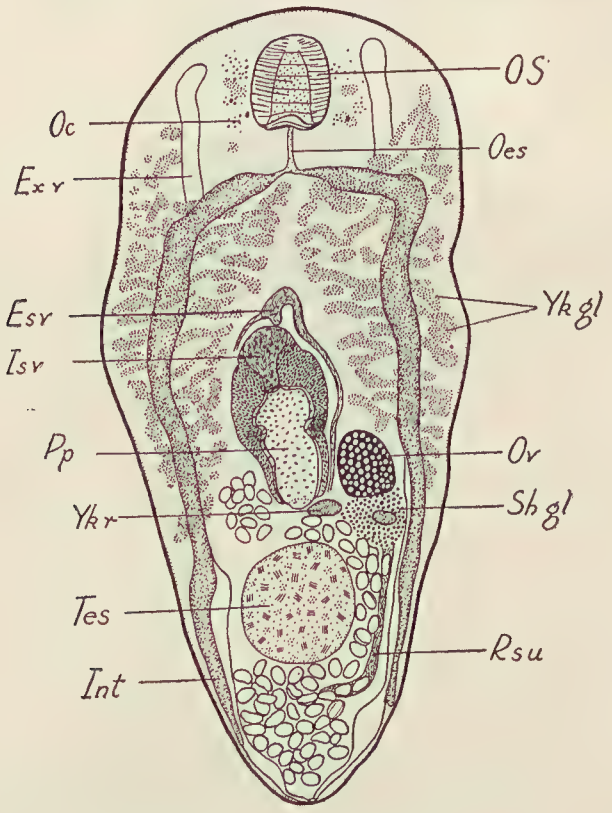


FIG. 13.—*Bivesicular australis*, n. sp., contracted whole mount from the dorsal aspect.

External Features: The small, highly-contractile trematodes, appear fusiform in the extended state, but when contracted they are clavate, tapering from before backwards. The oral sucker is funnel-shaped, and is terminal in position. It may be completely withdrawn into the body and in this position it communicates with the exterior through a ventral invagination of the body wall. No acetabulum is present.

The cuticle is thick and towards the front end of the animal is armed with extremely minute spinules. Numerous blindly terminating tubules occur around the border of the oral sucker and for some distance posterior to that organ. These tubules are quite similar to those described by Woolcock (1935) from *Helicometra tenuifolia*. As in that species the tubules are probably excretory in function. The genital pore is situated on the ventral surface in the mid-line, at the junction of the middle and last thirds of the body. The excretory pore is at the posterior extremity. The worms are 'ocular', an area containing pigment granules occurring on either side of the oesophagus.

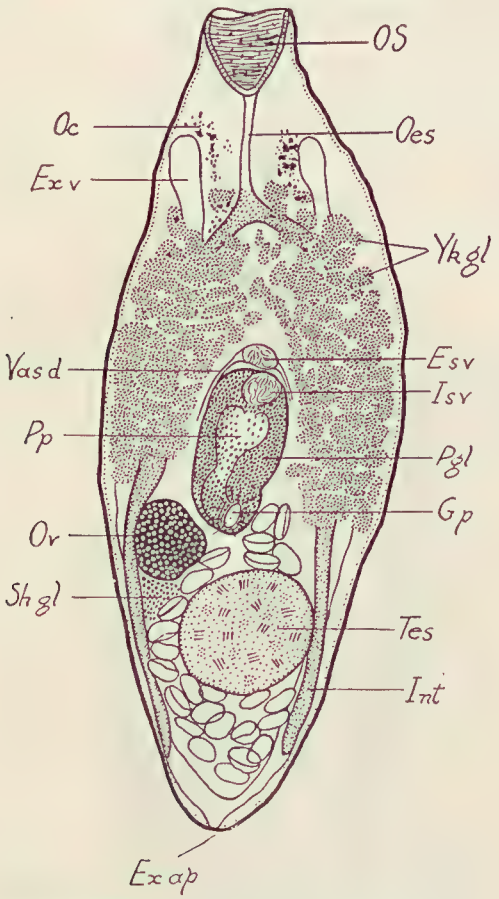


FIG. 14.—*Bivesicula australis*, n. sp., extended whole mount from the ventral aspect.

Alimentary System: The oral sucker opens directly into the oesophagus, a distinct pharynx being absent. The oesophagus is narrow and its length varies greatly according to the state of contraction of the specimen. When contracted its wall is strongly muscular possessing stout inner circular and outer longitudinal fibres. Posteriorly the oesophagus opens into the gut rami, which diverge sharply and come to lie close to the body margins. The rami extend backwards almost to the posterior extremity of the body, as smooth sinuous tubes, uniformly round or oval in section and tapering considerably towards their extremities. The walls of the rami are membranous and lined by a flattened epithelium containing very numerous ovoid nuclei.

Excretory System: Paired excretory vesicles fuse immediately in front of the excretory pore. They extend forwards from this point as greatly distendable tubes which pass forwards on either of the testis, lying below the gut. Anterior to the testis they narrow and pass between the gut rami and the cirrus-sac. In front of the cirrus-sac they pass between the converging gut rami, and occupy the bulk of the lateral regions of the body. In contracted specimens the vesicles appear to terminate in front of the posterior border of the oral sucker, but when the animal is normally extended they do not reach the level of that organ. The walls of the excretory vesicles are membranous, containing widely-separated nuclei.

Reproductive System: i. *Male.*—The single large testis is median, lying in the intercaecal space in the posterior third of the body. It is circular or roundly oval in outline and flattened dorso-ventrally. The testis is bounded by a membranous wall containing flattened nuclei. Two vasa deferentia arise from the anterior border of the testis, and run forward along the right and left sides of the cirrus-sac. The cirrus-sac is a relatively large cylindrical structure which measures 0·33 mm. in diameter, and 0·65 mm. long in the largest specimen. It occupies the middle third of the body length and lies in the mid-line entirely in front of the genital pore. Its wall is strongly muscular, consisting of stout inner circular and outer longitudinal fibres. The vasa deferentia expand and fuse into a small 'external' seminal sevicle which lies at the anterior end of the cirrus-sac. This vesicle communicates with an 'internal' seminal vesicle within the cirrus-sac, by means of a fine duct.

The 'internal' seminal vesicle possesses a weakly muscular wall and is almost spherical in form. It narrows abruptly into a short muscular duct surrounded by a sphincter. This duct leads into the pars prostatica, which occupies most of the volume of the cirrus-sac. The wall of the pars is thick, being composed of stout outer longitudinal and inner circular fibres. It is lined by the typical empty-looking cells, which are relatively tall. The musculature and the epithelium are more strongly developed along one side producing a prominent ridge which projects into the lumen. Anteriorly the pars is produced into two lateral pouches, one of which extends forwards on either side of the internal seminal vesicle. The remaining space within the cirrus-sac is occupied by the well-developed prostate gland. This consists of a matrix in which numerous ovoid nuclei are embedded. The nuclei are densely arranged in an outer zone near the sac wall, leaving an inner clear zone surrounding the pars prostatica which consists of radiating protoplasmic strands. A short distance in front of the posterior end of the cirrus-sac the pars prostatica passes through the ventral wall of the sac and opens into the common genital atrium.

ii. *Female.*—The ovary is a smooth spherical or ovoid body lying on the right side of the body at the level of the genital aperture or slightly in front of that level. Topographically it lies between the right ramus of the gut and the hind end of the cirrus-sac, and towards the dorsal surface. The ripe egg-cells measure 12 μ in diameter. Postero-ventrally the ovary tapers into a wide muscular oviduct. This runs backwards and expands, directly behind the ovary, into the ootype. Laurer's canal is given off approximately at the middle length of the oviduct. The canal, which is very narrow, winds a sinuous course to a minute pore in the cuticle in the mid-line at the level of the anterior border of the testis. The ootype is surrounded by a large compact shell gland which consists of a vacuolate matrix through which numerous nuclei are uniformly distributed. Individual cell boundaries are not distinguishable.

The yolk follicles are numerous small irregular bodies filling the body from the level of the genital atrium to the level of the middle of the oesophagus. In a small mounted specimen (Fig. 14), the follicles are more uniform and display a greater degree of independence than in the larger specimens. The follicles of

the latter have a tendency to fusion (Fig. 13). The yolk is collected into a transversely elongated reservoir which lies on the left side of the shell gland. A duct from the reservoir opens into the oviduct as it enters the shell gland.

The uterus passes directly backwards on the right side lying near the dorsal surface, and fills the body behind the testis. The proximal descending portion of the uterus functions as a receptaculum seminis uterinum. After describing two or three loops behind the testis the uterus passes forwards beside its proximal portion and crosses the body in front of the testis. It describes a loop to the left side of the cirrus-sac before narrowing abruptly into a muscular metraterm

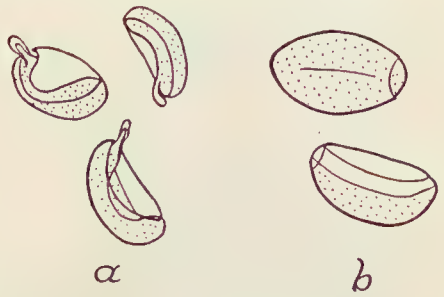


FIG. 15.—*Bivesicula australis*, n. sp., "a" eggs with polar process occurring in one specimen collected, "b" eggs from specimen in Fig. 14.

which leads to the genital atrium. The few eggs are light-yellow in colour and variable in size. In one specimen (2, in the above table), the eggs bear at one end, a blunt hollow appendage measuring 16 μ long and 5 μ thick (Fig. 16). In the remaining specimens this appendage is entirely lacking. The presence of this unipolar process upon the eggs of the one specimen does not appear sufficient grounds for placing it in a separate species.

Discussion: The genus *Bivesicula* was erected by Yamaguti (1934) for a single species, *B. claviformis*. He considered that form sufficiently differentiated from the rest of the Monorchiidae to warrant the formation of a new sub-family. Later Yamaguti (1938) described two further species, *B. synodi* and *B. epinephali*. A further allied species which differed from the above three species in that the intestine and vitellaria extended backwards beyond the testis, and in that the uterus was limited to a region in front of that organ, was placed in a new genus *Bivesiculoides*. The same author (1940) raised the sub-family to family rank.

Bivesicula australis n.sp. resembles the three known species of the genus in the extent of the vitellaria and the uterus but it is similar to *Bivesiculoides* in that the gut rami extend almost to the posterior end of the body, and in the possession of the lateral pouches of the pars prostatica. It thus provides a link between the two genera. The length of the gut can no longer be regarded as a means of distinction between the two genera, and accordingly the generic diagnosis of *Bivesicula* must be amended to include species in which the gut rami may extend posterior to the testis.

REFERENCES

CROWCROFT, P. W., 1946.—A Description of *Sterrhurus macrorchis* n.sp., with Notes on the Taxonomy of the Genus Sterrhurus Looss. (Trematoda-Hemiuridae). *Pap. Proc. Roy. Soc. Tasm.* 1945 (1946), 39-47, pls. 2-3.

MANTER, H. W., 1934.—Some Digenetic Trematodes from Deep-water Fish of Tortugas, Florida. *Carnegie Publ. No.* 435, Wash., 261-435, 15 pls.

————, 1940.—Digenetic Trematodes of Fishes from the Galapagos Islands and the Neighboring Pacific. *Rep. Alan Hancock Pacif. Exped.* 2, No. 14, 329-457, pls. 32-50.

VAZ, Z. and PEREIRA, C., 1930.—Nouvel Hemiuride parasite de *Sardinella aurita* Cuv. et Val., *Parahemiurus* n.g. *C. R. Soc. Biol.* 103, 1315-1317.

WOOLCOCK, V., 1935.—Digenetic Trematodes from South Australian Fishes. *Parasitology*, Cambridge 27, 309-331.

YAMAGUTI, S., 1934.—Studies on the Helminth Fauna of Japan: Trematodes of Fishes i. *Jap. Journ. Zool.* Tokyo 5, 249-541.

————————, 1938.—Studies on the Helminth Fauna of Japan: Trematodes of Fishes iv. Kyoto, Japan (Maruzen & Co.) 1-139.

————————, 1940.—*Jap. Journ. Zool.* Tokyo 9, No. 1, 211-230.

Pap. and Proc. Roy. Soc. Tasmania, 1946 (15th October, 1947)

Pontobdella tasmanica nom. nov. (Hirudinea)

By

V. V. Hickman

(Read 5th November, 1946)

In the Papers and Proceedings of this Society for the year 1941, I described under the name of *Pontobdella verrucosa* a new Tasmanian marine leech. Professor M. C. Meyer has informed me that the name *Pontobdella verrucosa* is pre-occupied, having been given to a European leech by Dr. F. Leydig in 1851. It is necessary that a new name be given to the Tasmanian species and I therefore propose the name *Pontobdella tasmanica.*

References

Hickman, V. V., 1942.—A New Ichthyobdellid Leech and its Egg-capsules. *Pap. Roy. Soc. Tasm.* 1941 (1942), p. 41.

Leydig, F., 1851.—Anatomisches über Branchellion und Pontobdella. *Zeitschrift für wiss. Zool.*, Bd. III, p. 318.

Pap. and Proc. Roy. Soc. Tasmania, 1946 (15th October, 1947)

Note on *Hesperilla chrysotricha plebeia* Waterhouse (Lepidoptera-Hesperiidae)

By

L. E. Couchman

In this note I record the capture of a butterfly which has remained for more than thirty years the rarest species of its group in Tasmania, no more than four specimens being previously known.

The species was first made known from Tasmania when Waterhouse and Lyell (1914) recorded two males from Bridport. These two specimens were placed under subsp. *cyclospila* Meyrick and Lower, which was originally described from 'Port Lincoln, South Australia: Melbourne, Victoria'.

Hardy (1918) identified a female taken at Latrobe, January 1st, 1915, as *cyclospila* M. and L., but did not describe it.

Waterhouse (1927) when separating the Tasmanian form as a distinct subspecies referred only to the two male specimens from Bridport taken many years before, and made no reference to Hardy's note of the capture of a female specimen.

Referring again to the Tasmanian subspecies, Waterhouse (1932) mentioned four males, from Bridport and Latrobe, but still did not refer to Hardy's female specimen from the latter locality.

Since 1932 this form has not been noted from Tasmania, and the female has remained undescribed throughout the years. As the only records were from Bridport and Latrobe I had considered this species would be confined to the northern coastal areas of Tasmania, but the chance discovery of two empty pupae cases of a form unknown to me on *Gahnia trifida* Lab. at South Arm in January, 1946, led me to suspect that this species might be found in the southern half of the island. A fairly close search on the eastern shores of the Derwent was not however productive of any specimens.

In January, 1947, while collecting on South Bruny, the chance capture of a perfect female specimen within a few yards of the shore line led me to search the extensive swamp area near Lunawanna, with the result that a few females and several males, including a pair taken in cop., were secured. A male specimen emerged at Hobart on January 18th from the only pupa found, although several empty cases were noted in the distinctive twisted shelters which the larvae form from a number of leaves of *Gahnia trifida*.

The description of the female is as follows:

Upperside: forewing brown, basal half covered with short yellowish hairs; cell spot 1·5 mm. square, pale yellow, hyaline; discal spots half this size in areas 3 and 2, a much smaller spot in lower half of area 1a, and a minute dot in upper half of area 1a, pale yellow, hyaline; three subapical spots, white, hyaline; cilia grey brown. Hindwing brown, basal half covered with yellowish hairs, an oblong central patch, and a few scattered scales below the patch, orange; cilia grey brown.

Underside: forewing brown, apex broadly snuff brown, area above cell spot dull yellow; hyaline spots as above; cilia grey brown. Hindwing snuff brown, at dorsum grey brown; a small spot in cell, brown centred silver white; a series of small elongate discal spots from 1a to 6, that in area 6 twice as large as the others, brown; the spots in areas 2, 3, and 6 centred silver white. Cilia grey brown.

Forewing length 17 mm.

Neallotype female labelled 'Lunawanna, Tas. 12-Jan.-47. L. E. Couchman', in the Tasmanian Museum, Hobart, one paratype, 'Lunawanna, Tas. 13-Jan.-47. L. E. Couchman', lodged in the Australian Museum, Sydney, and three paratypes, 'Lunawanna, Tas. 14-Jan.-47. L. E. Couchman' in my own collection.

In the type, and in two of the paratypes, the minute dot in upper half of area 1a of forewing is just discernible on the upperside, in the other two specimens it is only marked on the underside.

Since the male description was based on two specimens from Bridport, and does not in all respects accord with bred and captured males from South Bruny, I note these distinctions. In the Lunawanna males the ground colour above is brown, overlaid on the basal half of the forewing and the hindwing with a dusting of yellowish hairs; the three subapical spots are white, hyaline; the cell and discal spots pale yellow, hyaline, the spot in area 2 half the size of that in area 3; the grey black sex brand is composed of a series of crescents from vein 4 to below vein 1a.

The oblong central patch of the hindwing is orange, and usually there is a scattering of orange scales, divided by vein 4, below the central patch. Beneath, the elongate discal spots of the hindwing vary in size, but that in area 6 is always much larger than the rest, and like the cell spot is always centred silver white.

Forewing length 15 mm.

The rarity of this form would seem to be due to its excessively local character; although the food plant, *Gahnia trifida*, as noted by Rodway, is common in brackish swamps, and as I found, is abundant throughout the swamps of South Bruny, the butterfly was confined to an area of less than two acres, and no specimen was noted outside this one restricted locality.

It seems quite possible however, that this species may be found in other coastal localities, particularly on the northern and eastern coasts of Tasmania, but perhaps as restricted in area as on South Bruny.

References

HARDY, G. H., 1918.—*Pap. and Proc. Roy. Soc. Tasmania* 1917; 67.

WATERHOUSE, G. A., 1927.—*Proc. Linn. Soc. N.S.W.* 52 (3); 281. 26, f. 23, 24.

————————, 1932.—*What Butterfly is That?*; 242. 32, f. 6.

WATERHOUSE AND LYELL, 1914.—*Butterflies of Australia;* 188-189.

PLATE I

Hesperilla chrysotricha plebeia Waterhouse.

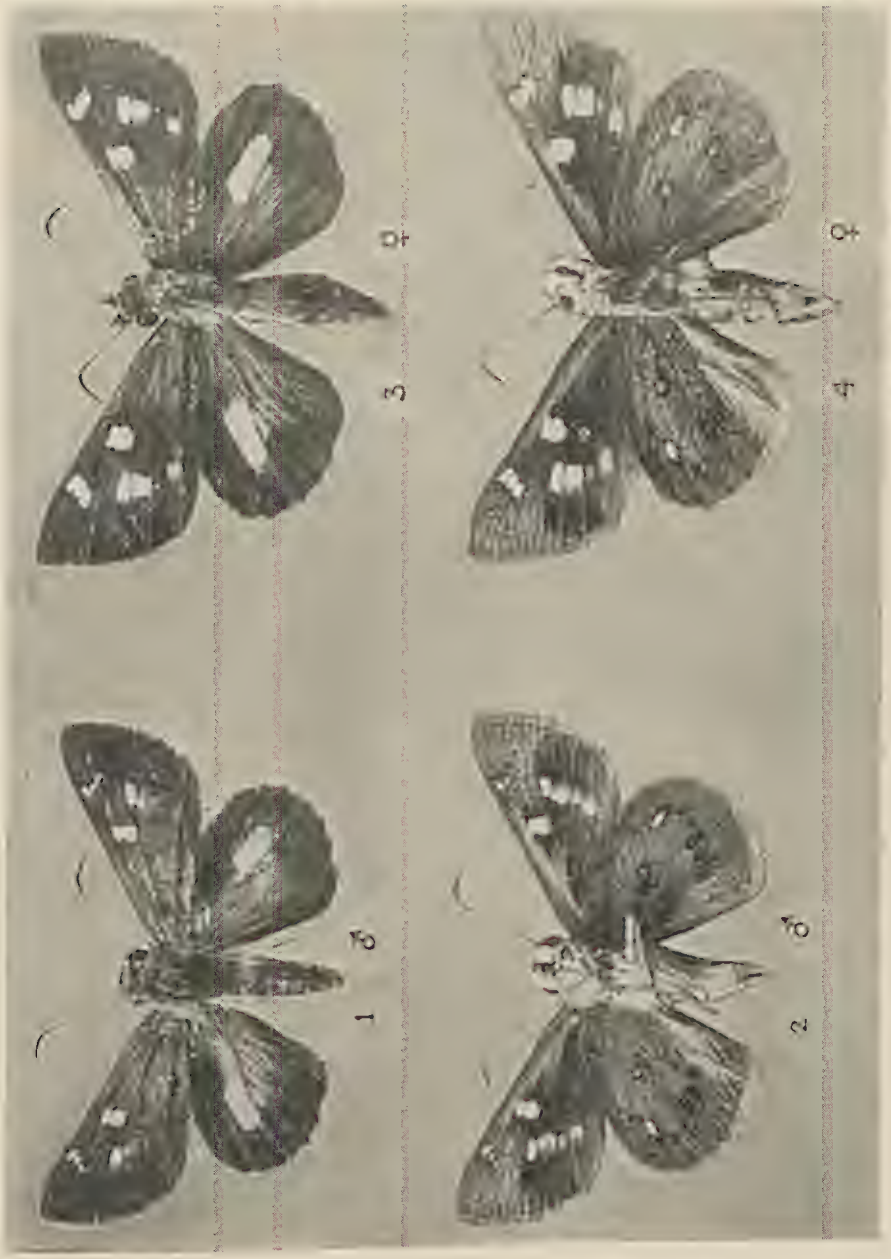
FIG. 1.—Male, upperside. Lunawanna, Tas. 14-Jan.-1947.

FIG. 2.—Male, underside of same specimen.

FIG. 3.—Neallotype female, upperside. Lunawanna, Tas. 12-Jan.-1947.

FIG. 4.—Neallotype female, underside of same specimen.

All figures × 2.



(Photo. Tas. Govt. Photo. Lab.)

Pap. and Proc. Roy. Soc. Tasmania, 1946 (15th October, 1947)

Phyllachne Colensoi (Berggren), an Addition to the List of Sub-Antarctic Plants in the Tasmanian Flora

By

Winifred M. Curtis

Certain Tasmanian plants of the Austral-Montane formation are characterised by a peculiar life-form and are described as 'cushion' or 'bolster' plants. These plants grow in dense tufts and make hard convex patches on the ground. Each may be several feet across, forming a compact mass that is firm underfoot.

Phyllachne Colensoi (Berggren), belonging to the family Stylidiaceae, is a cushion plant similar in habit to four plants that are common on Tasmanian mountains. These four species included by Rodway (1903) in 'The Tasmanian Flora' belong to three different families, namely:—

Compositae	*Abrotanella forsteriodes* Hk.
	Pterygopappus lawrencii Hk.
Stylidiaceae	*Donatia novae-zealandieae* Hk.
Epacridaceae	*Dracophyllum minimum* F.v.M.

Specimens of *Phyllachne Colensoi* were collected in the Lake St. Clair Reserve, from the summit of Mt. Rufus (approx. 4000 ft.) by Mr. C. G. Elliott, B.Sc., in February, 1947. Material of this species in the Tasmanian Museum Herbarium (Rodway Collection) had been taken from the same locality in December, 1917, but had not been separated from the closely allied *Donatia novae-zealandieae.*

By the courtesy of Miss L. Moore, M.Sc., of the Plant Research Bureau, Wellington, I have been able to examine specimens of *Phyllachne* from the North and South Islands of New Zealand and from Auckland Island. The Tasmanian plant proves to be the *P. Colensoi* of New Zealand.

Phyllachne Colensoi (fig. 1) may be distinguished from other Tasmanian cushion plants by both floral and vegetative characters. The small flowers are solitary and terminal, scarcely raised above the general surface level of the plant. The calyx consists of 5-6 sepals, yellowish-green, rather thick, adnate to the ovary, the free portions being approximately 2 mm. in length. The corolla is white, gamopetalous, 5-6 lobed, the tube being as long as the sepals, and the lobes spreading. These may be rounded or irregularly lobed. Stamens and filaments are united with the style to form a column which is conspicuously exserted. This character serves to distinguish *Phyllachne* from *Donatia* in which the two stamens, though arising close to the base of the style, are separate from it. (For this reason *Donatia* is more usually regarded as a member of the Saxifragaceae, although the species shows affinities with the Stylidiaceae.) In *Phyllachne* the two reniform stamens are sessile at the top of the column, they dehisce transversely. Two stigma lobes protrude between the anthers. The inferior ovary is incompletely 2-celled: above it are two conspicuous fleshy glands. Both unisexual and hermaphrodite flowers occur. In the female flowers the stigmas are large and papillose but the anthers remain small, they shrivel before the bud is fully open. In the hermaphrodite and male flowers the stigmas are small and smooth.

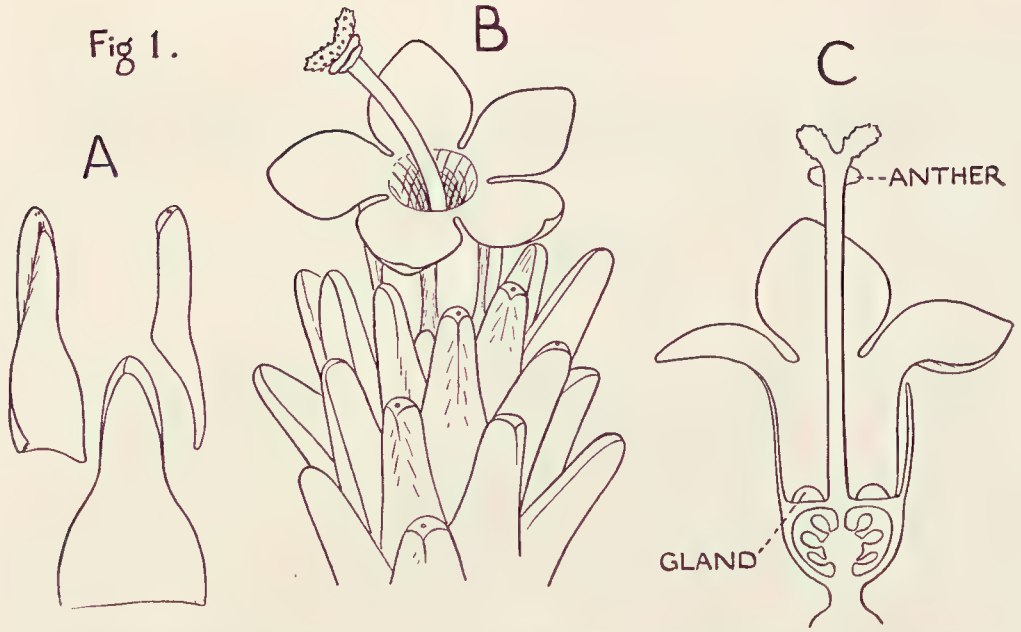


FIG. 1.—*Phyllachne Colensoi* (Berggren), × 10. A, leaves; B, flowering axis; C, flower in longitudinal section

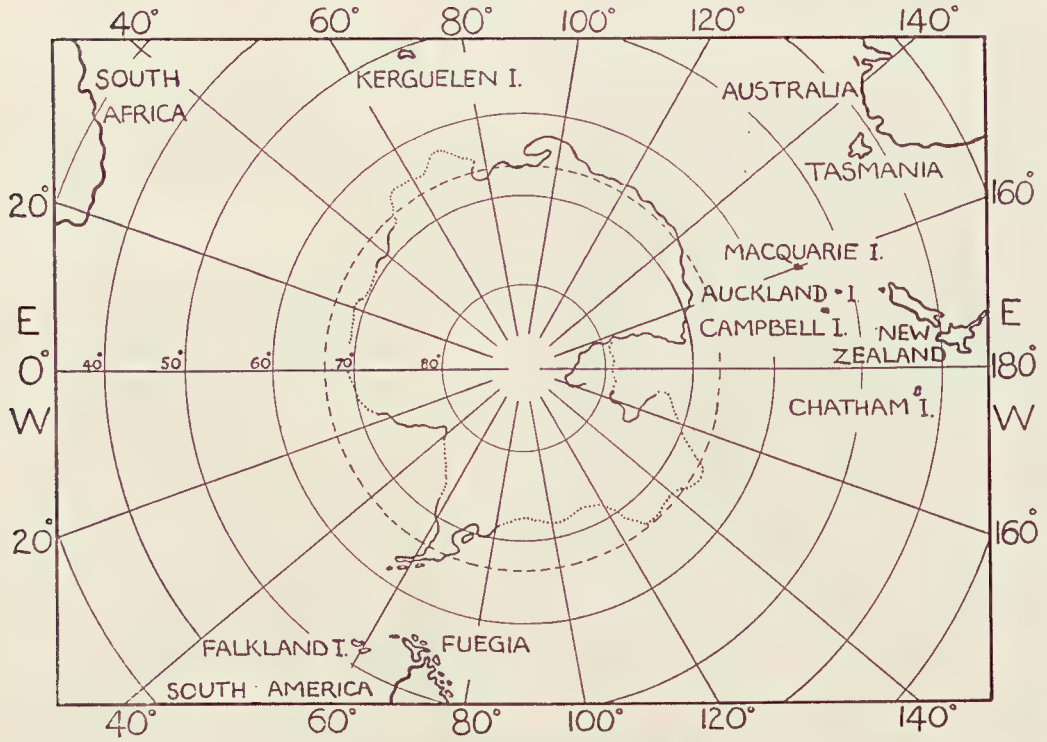


FIG 2.—The South Polar Regions.

Allan and Wall (1946) record that the name Phyllachne (Gk. *phullon*, leaf: *akhne*, chaff) was given in reference to the subulate and glumaceous leaves and perianths. The leaves of *P. Colensoi* are closely imbricated: each is glabrous, linear and thick but widened and flattened at the base. The apex, which is often brownish-yellow in colour, is slightly spathulate. A glandular pore is present just below the apex on the abaxial side.

The family Stylidiaceae is a small one restricted to the Southern hemisphere and having its maximum development in Australia. The largest genus *Stylidium* reaches the West coast of the Bay of Bengal, other genera are found in New Zealand and in South America. The genus *Phyllachne* is known in New Zealand, in the Auckland and Campbell Islands and in Fuegia. The record of the occurrence of *P. Colensoi* in Tasmania is of interest in showing the distribution of this genus, belonging to a characteristic Australian family, to be circumpolar. Of some 100 genera and 56 species of plants listed by Hooker (1860) as common to the three great South-temperate land-masses, very few are representative of orders regarded as typically Australian.

Knowledge of the geological history of the families of Angiosperms is very incomplete. Modern flowering plants may be recognised in fossil remains of the Cretaceous and many of the families now restricted in area of distribution then had a far wider range. The existing isolation of Australia is geologically old and the characteristic flora would appear to have evolved in conditions of increasing aridity. This flora shows a relationship with that of Africa, a number of families, though few genera, being common to the two continents. A different type of flora is found on the mountains of Tasmania and S.E. Australia. This "Southern" flora contains few plants of the typical Australian orders, but the majority of the genera are peculiar to the South temperate zone and many are circumpolar in distribution. The dispersal of such plants across barriers such as the oceans as they exist to-day, is very difficult to visualise. Hooker (1853) examined the seeds and methods of seed dispersal of one characteristic plant of the Southern flora (*Oxalis Magellanica* Forst.) and concluded that its seeds could not be dispersed across the existing oceans. Some problems concerning the dispersal of certain plants having a circumpolar distribution in the sub-Antarctic are discussed by Rodway (1914). He supports Hooker's view that the botanical affinity between the floras of the South temperate continents and the islands South of them, can best be explained on the assumption that a large and more continuous tract of land existed in the Antarctic and was a habitat for plants, at the time when the chief families of Angiosperms were evolved. The present Southern flora would then be a relic of a flora once widespread, that has survived only at high altitudes. Among the few typical Australian plants in this flora the family Stylidiaceae is most strongly represented. The genus *Forstera* is represented by one species in Tasmania and three in New Zealand; *Phyllachne* is now known to be circumpolar in its distribution.

Donatia like *Phyllachne* is recorded from Tasmania, New Zealand and Fuegia, but the distribution of this genus, because of its affinity with the Saxifragaceae, raises other problems concerning the North and South migration routes of plants.

References

Allan, H. H., and Wall, A., 1946.—The Botanical Names of the Flora of New Zealand.

Hooker, J. D., 1853.—Botany of the Antarctic Voyage Part II, Vol. I London.

————, 1860.—Botany of the Antarctic Voyage Part III, Vol. I London.

Rodway, L., 1903.—The Tasmanian Flora. Hobart.

————, 1914.—Botanical Evidence in Favour of Land Connection Between Fuegia and Tasmania during the Present Floristic Epoch. *P. Proc. R. Soc. Tas.* 1914, p. 32.

Pap. and Proc. Roy. Soc. Tasmania, 1946 (15th October, 1947)

Leaves from the diary of a Van Diemen's Land official

By

W. H. Hudspeth

(Read 8th October, 1946)

Introduction

Before I ring up the curtain, and bring before the footlights the characters who played their parts upon the little Stage of Van Diemen's Land Society of the first half of last century, described for us with such fidelity in the pages of the Diarist about whom I propose to talk to-night, I ought, perhaps, to remind you that the circumstances in which they lived, and the various offices they filled, were vastly different from those of the present day. During those years Tasmania was a Crown Colony, governed from Downing Street. The Governor, the chief civil officials, the officers of the Army and Navy, and the Clergy, were all appointed and paid by the Imperial Government. They regarded themselves as a more or less privileged class, apart from and superior to the rest of the community, and were thus rather disposed to magnify their office, and to treat the ordinary residents as 'lesser breeds without the Law'. In return, they were often subjected to a deluge of critism from Press and Public, which to-day would be considered as exceeding the bounds of good taste, and would probably involve the author in a claim for heavy damages for libel in a Court of Law.

The author of the Diary, George Thomas William Blamey Boyes, better known by his contemporaries as 'Alphabetical Boyes', was born at Stubbington in England in 1787. After leaving school he entered the Army in the Commissariat Department, and at the age of 24 years was sent to Lisbon, and served under Wellington during the Peninsular War. At the conclusion of hostilities he returned to England and married.

In 1823 he received orders from the Treasury to proceed to New South Wales, to join the Commissariat Department there under General Darling, as Deputy Assistant Commissary General, and when, in 1826, the Commissariat Department of Van Diemen's Land was separated from that of New South Wales, he was transferred to Hobart Town, to take up the office of Auditor of Civil Accounts, and remained in the Public Service of this Colony until his death, in 1853.

He might well be called 'The Samuel Pepys of Van Diemen's Land', for during the whole of his official life he kept a Diary, in which, like his famous prototype, he records almost every detail of his daily life. Its thirteen closely-written volumes, which are now in the possession of the Royal Society, contain, in addition to domestic and personal items, a mass of social gossip and scandal, obviously not intended for publication, as well as information of official and historical interest, and provide us with an extraordinarily vivid picture of contemporary life in this community.

With the possible exception of the Knopwood Diaries, they constitute, perhaps, the most complete personal record of current events yet discovered.

His official duties were competently performed, and he enjoyed the confidence of all the Governors under whom he served, and, what is more remarkable, he managed to steer clear of conflict with those among whom he moved and worked. Arthur speaks of his 'zeal, ability, and urbanity, gratifying to the Government and residents of the Colony', and even the V.D.L. Chronicle, in commenting on his appointment as Colonial Secretary, expresses satisfaction that the post had gone to a man 'of known amenity of manner and amiable disposition'. This was high praise, indeed, from a paper noted for its hostility to the Franklin régime.

Mr. Boyes' official position as Colonial Auditor, Colonial Secretary, Caveat Commissioner, Member of the Executive and Legislative Councils, and Member of the Committee of the Queen's Orphanage, brought him into contact with all grades of Society, and his pen portraits of contemporary notabilities are among the most interesting items in the Diary. From these, and from his descriptions of current events, I have selected such passages as may, I hope, afford both historical interest and entertainment. I take no responsibility for the opinions and criticisms expressed, which are solely those of the writer, and are reproduced for the benefit of students of Tasmanian history (1).

Let us take first his sketches of the four Governors under whom he served:

Col. George Arthur

Of Lt. Governor George Arthur he says this: 'B— in the course of conversation said there was a chilling formality about Government House that he could never bring himself to feel easy under. He believed there was no want of intention to do what was civil and agreeable and to make themselves popular, but the fact was, and it was useless to attempt to conceal it, they had not the tact and did not understand it. He said, however, that Col. Arthur was a different man tête-a-tête. He was with him one evening after Council till twelve o'clock, toe to toe, until they had finished two bottles of port, . . .'

Dr. S— told me that he was once sent for to attend Mrs. Arthur when she was in a very alarming way. He was at Government House two, three, and four times a day . . . . and by dint of the greatest care, and at the expense of a considerable portion of his time, effected a perfect cure. In the course of his attendance he was never asked to take a glass of wine, or other refreshment, and, when he announced to the little great man that the patient was restored, he was dismissed with thanks so cold that it chilled his heart to receive them . . .'

'S— said that Arthur, when he had any measure to effect, never dashed boldly at it, like the eagle soaring in the sunbeams, but set to work underground, like a mole, and, after you had been wondering where he was gone, and what he was doing, you discovered him rising out of the ground, after a subterranean, tortuous track, at the further end of the field . . . . '

'B— spoke of Arthur's excessive unpopularity—said that he was universally disliked, that he had a most convenient memory, forgetting when it tended to his interest, and remembering on similar occasion. That Montagu, his nephew, railed against him as much as anybody, and that not a single solitary individual amongst all the Civil Officers placed the least confidence in him. That he treated those who were disposed to be his friends with coldness and neglect; at the same time he stood in awe of the Editor of a public newspaper, and would at any time give 1000 acres to stop the vituperation of a Murray, or a Gregson.'

'S—, as usual, full of Arthur's ill-treatment of him, Said that whenever he suggested a prosecution on the part of the Crown, Arthur attributed it to his desire to embroil him with the people and make him unpopular . . . . He said

(1) For reasons which will be apparent I have, wherever possible, used initials of persons referred to.

he would write Home for another appointment, as there seemed no chance of Arthur's removal. If A. went to New South Wales to succeed General Bourke, he' (S—), 'would not go there.'

'The Government of the Colony is nominally vested in the Lt. Governor and an Executive Council. I say nominally, because the Executive Council, as a Body, is powerless. The real Government is composed of Col. Arthur, his two nephews, and Murray, the Editor of the "Tasmanian" newspaper.'

Strange to say, he throws doubt upon Arthur's understanding of the penal System:

'He relies' he says, 'upon others—indeed, the habit of viewing things with the eyes of others disqualifies him from profound and useful observation. For a little time it was supposed, though, as it turns out, erroneously, that he made use of his own. But, after trying Hamilton's Stephen's, and those of a few others, he has settled down into an absolute abandonment to his nephew's guidance, and is content to depend exclusively upon Capt. Forster's optical apparatus. When sojourning for a short period at the houses of Settlers in the interior, his eyes are not more likely to be cleared of the films of prejudice that obscure them than when recreating his pen and ink faculties in the Council Room at Government House. These people are aware of his peculiar and distorted way of considering the ramifications of prison discipline, and take care not to risk the loss of favour by citing instances, or volunteering information in the slightest degree opposed to his favourite theory. The Archbishop of Dublin, at a distance of 16000 miles from the experimental ground, is evidently much better instructed upon the real merits of the System than His Excellency himself, notwithstanding a residence of twelve years, and all the means and appliances to boot. So much for obstinancy and blindness . . . '. As to Arthur's relations with Lathrop Murray—he says:

'B— called upon me, and related an extraordinary interview that Murray had with his Ex., in the presence of Macdowell, at His Ex's request: His Ex.—"I wish to ask you, Mr. Murray, whether there is any truth in the report that I am on intimate terms with you?" Murray: "I beg to say that I do not consider it would add to my respectability if I visited Government House, I do not require any aid from the reputed intimacy of the nature alluded to, to improve or preserve, my standing in Society." or words to that effect.'

He relates the manner in which the news of Arthur's recall was received:

'N— looked in and asked me if I had heard the news, I replied in the negative. He then said that Col. Arthur was recalled . . . The Despatch was brought by the "Elphinstone", but only opened that morning. It was all over the town in half an hour. The news seemed to diffuse general joy.'

Then follows an account of the farewell Levée at Government House:

'I took leave of Col. Arthur. "Goodbye Mr. Boyes", said His Ex. in a tremulous tone. "How are Mrs. Boyes and the children? God bless you all." Immediately afterwards he walked from the Drawing Room, where he had taken leave of us, round by the verandah, leaning upon Mr. Pedder's arm, and weeping bitterly. Then up to the turning by the Courthouse and down Murray Street, to the New Wharf, followed by all the Public Officers, Civil and Military, and by several hundreds of the Townspeople—and embarked in the midst of cheers and under a Salute from the ships in the harbour.'

Before passing away from Col. Arthur, you may be interested to hear Mr. Boyes' account of the Campaign organized by Arthur against the aborigines, known as 'The Black Line'. It is contained in a letter, dated 31st October 1830, written to his wife, who was then in England: "Now"—he says—"for a little about the state of the Colony, which is at this time pecularly interesting, being

pregnant with important results. By some mistake or other, the Aborigines of the Country (Blacks) have been led to look upon the white intruders with hatred, malice, and all uncharitableness. I hope sincerely they have not been taught the trade of butchery, which they have been indiscriminately carrying on for the last two or three years, by those who, if they have so done, are a thousand times worse than the savages themselves. It is generally supposed that the whites, if not the original aggressors, have, by seizing on the black women, and otherwise ill-treating the wild and ignorant denizens of the forests, greatly contributed to aggravate the roused ferocity of their natures. However that may be, for a long time past they have been the dread of the Interior of the Island. They have murdered Storekeepers by dozens—they have rushed upon the cottage of the Settler, and consigned men, women and children to indiscriminate slaughter. Scarcely a white man has ever approached their haunts and escaped with life. Our papers were filled weekly with the atrocities of the Blacks, and it had become apparent that, unless means were devised for allaying the cruel spirit of these wretches or of making them prisoners in a body in some well-adapted part of the country, or of exterminating the race, that the country must be abandoned. All other means having been tried unsuccessfully, the Government found itself reduced to the second and third of the experiments just mentioned, and with that object in view the most vigorous and extensive measures have been taken that the resources of the Colony could put into operation. It appeared that if a line of posts were to be formed from the sea on the eastern coast to a certain district westward, the most active and dangerous of the tribes would be shut up in the south-eastern portion of the Island, and that by approximating the posts, quietly and steadily, to each other, advancing gradually at the same time southwards, the Blacks would be forced to retire, until driven to a neck of land which separates a considerable tract from the Main, forming almost an island; and then, assailed with all the collected strength, they would be obliged to seek shelter from the arms of their enemy by defiling through the narrow isthmus, which having once done, their capture would be considered effected. The spot is easily defended by a small party, and a depot is already established for supplying them with provisions, as it is evident that, cut off, as the Blacks would be in that situation from their natural resources, they would depend entirely upon the Government for food and protection, and thus in time be probably brought into a state of civilization, if of such they are capable. To do this we have all been obliged to contribute in some way or other. The Governor has taken the field with almost all the military; The ticket-of-leave men, Constables, and as many assigned servants as could be spared, have been marshalled, equipped for the field, and distributed, like the soldiers, along the line, or formed into parties scouring the Bush. Many of the young men, clerks in public offices, have put knapsacks on their backs, rations in their pouches, and guns upon their shoulders, and have marched, in charge of ten or twelve men each, to the destined scene of action. The military duties of the Town are performed by the inhabitants, generally officered by the most respectable, and, as I am one of the elect, if you had chanced to walk up the street at a propitious time, you might have seen " Capt. Boyes ", as his men call him, though in truth he can only be a non-commissioned Officer upon his service, walking down the same street with half-a-dozen parti-coloured soldiers, with muskets and bayonets fixed, forming the relief. That Gentleman has now been four times on Duty, that is to say every sixth day and night. The Main Guard relieves at six in the morning, and remains on till six the next. It is very tiresome, and (to drop the third person singular for the first), I am quite sick of it. The strangers just landed from two or three ships from England stare at such an unusual sight of men in plain clothes performing military duties, with all their eyes.

It will continue, I am afraid, some weeks longer. The Governor is disposed to believe that his operations have been completely successful up to the present time, and I hope they have. They also believe that there are white men acting as leaders among the Blacks, and inciting them to atrocity. It is only lately that this impression has been received, and, if it should be true, it will account for many circumstances attending the movements of the Natives, which before were wrapped in mystery."

A few days later he writes:

'The Lt. Governor and the Forces, both Civil and Military, are still in the Bush. Nothing decisive has taken place, but there is now reason to believe that a considerable number of the Natives are enclosed, and will ultimately be made prisoners.'.

Note.—As we all know, the Drive was a complete failure. It cost, all told, about £60,000, and the nett result was the capture of one man and a boy—and that was accidental!

Sir John Franklin

The next vice-regal figures to come under the spotlight in the Diary are Sir John Franklin, for whom he seems to have had a good deal of sympathy, and Lady Franklin of whom he speaks in terms of the highest admiration. His regard for Sir John, however, does not blind him to his defects as an Administrator, as will be seen from the following extracts:

'Saw N—. He adverted to a rumour of Sir John Franklin's desire to return to England, he being thoroughly sick of the complicated official labours, and the political discontents which wait upon his Government.' (This was in December 1837—barely eleven months after his triumphal arrival in January of that year)

'If', he adds, Sir John expected to slumber upon a bed of roses, fanned by balmy airs impregnated with "spicy odours from Araby the blest", or even exemption from the common crosses and vexations that attend even the ablest and most successful Administrator, he has, no doubt, been grievously disappointed. Had he brought with him some experienced, practical man of business, in whom he could have reposed confidence, his position here would have been happier . . . . As it is, I believe there is no hope for him but in retiring from a post for which, from all I can collect, he is totally unfitted.'

And again:

'Forster said that the Governor has got a "severe dressing" from the Treasury for interfering with the Customs . . . . He said it was the strongest expression of disapproval of a Governor's conduct he had ever seen, and desired His Ex for the future to refrain from meddling with the Customs, being a Department immediately under their Lordships' control.'

(This was followed, soon after, by another reproof to Sir John from the Treasury, in regard to arrangements made by him with the local Banks as to deposits of money from the Military Chest.) . . .

'Saw Mitchell at the Colonial Secretary's office, who was amusing at the expense of poor Sir John, whose nervousness and utter unfitness for business seems to form a stock of diversion for both Master and Man.' And here is a glimpse of Sir John's delight in the visit of Captains Ross and Crozier: 'At Government House. Sir John enthusiastic about the discovery ships—the "Erebus" and "Terror", He was quite warmed into enthusiasm, and spoke with such delight about the experiments and consequent calculations made by the Commanding Officers that he never looked to such advantage before.' But in matters of business and administration poor Sir John was rather at the mercy of his advisers: 'Thinking over all that passed between Sir John and myself the day before yesterday, it appears that

he has adopted the likings and dislikings, the opinions, views, sentiments, and even the very words, of those who are supposed to take the trouble of thinking for him.

All this time, while the self-deceived Ruler is merely giving utterance to the thoughts, and acting upon the subtle suggestions of his crafty advisers, he—honest man—flatters himself—nay believes—that in all he says and does he depends upon his own judgment alone, and that his mind is perfectly untrammelled, and thoroughly independent of all extraneous influences whatsoever.'

Sir John, as you know, was a little deaf, and probably got bored, as other people sometimes do, at meetings, such as we are attending to-night.

Here, for instance, is a picture of him at a meeting of our precursor, the Tasmanian Society: 'A paper was read on New Zealand—very badly, and so prosily that it sent Sir John to sleep. He snored, and blew like a grampus.'

I am sure many of you will sympathise with him.

About this time the trouble between Sir John and his Colonial Secretary, John Montagu, which had been brewing for some months past, was coming to a head, and there are frequent references to it in the Diary:

'From E— I heard that Montagu appeared out of spirits. Sir John has a fine game in his hands, if he knew how to play his cards, but, notwithstanding the abetting and encouraging of Lady Franklin, Henslowe' (Private Secretary), 'and young Bedford, I suspect he will forego all his advantages and make an inglorious peace with the offended power, by admitting he was wrong, and soliciting oblivion for the past. I have taken no part in the business, and do not intend to take any. If inclined to mix in the intrigues of a Government House, Sir John, with many good qualities, is about the last to trust oneself with. You could not calculate upon his coalescence for a week together, unless he could be kept in a constant state of excitement.'

'One thing is quite clear. He has reposed too much upon the zeal and fidelity of Montagu and Forster, and now finds that he has been altogether mistaken in them.'

Soon after this Montagu was dismissed, and there is this entry:

'When I left my office at four, the news had spread like wildfire. G— and S— said that all the Settlers would rejoice at M's dismissal, and would consider that Sir John by this vigorous step had completely redeemed his character.'

(Mr. Boyes was immediately appointed Colonial Secretary in Montagu's place.)

After an interview with Forster he remarks that the latter had told him that Lord Stanley was puzzled over Sir John's contradictory Despatches about Montagu and himself, and had naturally said, 'Which of them am I to believe—this, or the former? They cannot both be true, for they are diametrically opposite in character'. Towards the end of the conversation Forster said that if Sir John did not go, he (F) should. He said that the person who had written the Despatches was the one to blame, and not Sir John, who, he said, 'Would sign anything put before him.'

In January 1843 arrived the Despatch which was fatal to Sir John's Government. On this the comment is: 'The Despatch is written in a pert, inconclusive style, insulting to a degree—becoming a Lordship, possible, but beneath a Gentleman: and if what is said be true, that a copy of it was transmitted to Montagu, as the Secretary of State's decision in his case, nothing but His Lordship receiving half a dozen shots from "Old Blowhard" can expiate the deep offence.'

The appearance and circulation in the Colony of Montagu's 'Book', in which he had set out his Case against Franklin, had created a tremendous amount of excitement, and greatly annoyed Sir John:

'He is much disturbed', says the Diary, 'with a report that there is a Manuscript Book in this Colony, containing the whole of Montagu's "Case", as he puts it, and the conversations that took place between him and Sir John, including a long letter from the Rev. Fry' (Rector of St. George's Church), 'saying many things that must now jar on his ear, as he, of course, never expected this communication would come back to the Colony. Friends or foes, they are all served up, to suit Montagu's pleasure or convenience, with a selfish recklessness that I know no other man capable of.'

(Montagu had sent the Book out by Bicheno to Forster, with directions that when he had read it he was to forward it on to Swanston, Manager of the Derwent Bank, for private circulation among his friends.)

Sir John wrote to Swanston, calling upon him to shew him the Book, but the request was not complied with: 'He was very indignant with Montagu, Swanston, and all those who had read the book, and particularly against John Kerr, who had read it and would not tell him the contents.'

After this, events moved swiftly—Sir Eardley Wilmot arrived, and there was nothing left for the Franklins but to pack up and go.

On November 3rd 1843 they took their departure, after the presentation of a farewell address: 'Poor Sir John. He seemed to feel deeply this last public testimony of regard. At five, or a little after, we left his house. The Bishop on his right, Bicheno on his left, and immediately following him, in a cross line, the Attorney General, Maclean, old Bedford, the Archdeacon, Bagot, Fraser, Henslowe, and myself—surrounded by about 2000 people, who rent the air, and made the welkin ring with their shouts. The Brigade Major, in full Staff Dress, walked at the head of the procession, a few paces in advance of Sir John. As the Barge shoved off, a Salute was fired from the Prince of Wales Battery. The Barge was steered by Moriarty in his full dress as a Commander of the Navy.'

Lady Franklin

One of Montagu's chief charges against Sir John Franklin was that he permitted his wife to interfere in public affairs. We have had a hint of this already, and there are other entries which seem to indicate that there may have been some foundation for the accusation: Here is one: 'Dined at Government House. Took Lady Franklin in, and in the course of the evening talked to her upon the following subjects—The Executive Council, as now constituted, permitting every question to go one way, the Colonel commanding' (Col. Elliott) 'being nobody, and Turnbull being completely under the influence of the others; Burnett's coming out, and considering what his position would be in the Executive Council. She agreed with me.' And another:

'The Lt. Governor brought in, to show Lady Franklin and myself, a letter he had written to Major St. Maur at Launceston, about an indiscretion of Mr. Breton. Lady Franklin suggested that he add a paragraph that he, Sir John, notwithstanding the indiscretion, should not feel less disposed than before to give the Launceston people every assistance in his power.'

Of her character he speaks in the highest terms, notably in his account of her anxiety about the fate of Bastian and party, who had gone to their rescue during their trip to the West Coast: 'Dined at Government House . . . . in the course of the evening I had a good deal of conversation with Lady Franklin about Bastian and his party. She was very much moved at contemplating their probable fate, and burst into tears while talking about them.'

The next day he received from her a letter on the same subject:

'This generous, kindhearted woman is full of the most painful apprehensions for their safety, and implored me, if I could suggest any measure possessing the slightest claim to the probability of affording them relief, or, at the worst, of determining their fate, to adopt it at once, and how gladly—oh, how gladly—she would bear the expense, whatever it was. She begged I would not allow any consideration of that nature to weigh with me for a moment. It was horror itself to think of leaving those poor, gallant fellows to perish, who had undertaken their dangerous, and, she was afraid, disastrous enterprise, to rescue Sir John and herself from the perils with which they had been surrounded. She should never forgive herself if it afterwards appeared that there had been some means left untried . . . .

'She is certainly a noble creature—she deplored the conditions of the lost party in terms so eloquent, and yet so true to the heart, that I became as much moved as herself.' (The Bastian party was rescued in the end.)

Lady Franklin was of course greatly worried about the Montagu affair and its reactions on her husband. Soon after the arrival of Mr. J. E. Bicheno appears this entry: 'She came to the determination of asking Bicheno whether he had any reason to believe that a successor was appointed, or about to be appointed, to Sir John. She did make the inquiry, and Bicheno told her that he had no doubt about it.'

Sir John Eardley Eardley-Wilmot, Bart.

The next figure to come upon the stage at Government House was of a type very different from his predecessors.

In August 1843, before Franklin had relinquished his post—even before he had received official notification of his recall—there arrived, like a bolt from the blue, his successor—Sir John Eardley Eardley-Wilmot, Bart., of Berkswell Hall, County of Warwick, formerly M.P. for North Warwickshire, and Chairman of Quarter Sessions of the County of Warwick. His ship had overshot the mouth of the Derwent, and landed him on Forestier Peninsula, before anyone knew of his advent. At 2 a.m. Bicheno, the Colonial Secretary, was roused out of bed by a messenger who said that His Excellency was travelling overland from the East Coast, and would reach Hobart Town that evening.

In spite of the awkward fact that Sir John Franklin was still in Government House, things seemed to have passed off very well, in an atmosphere of cordiality. The usual addresses were presented, the usual Levée held, and the Franklins retired to a private house . . . .

But these happy conditions did not last for long, and before six months had passed it was apparent that the relations between Sir Eardley and his Colonial Secretary, (the Chief Executive Officer of the Colony) were becoming strained, and the sticklers for vice-regal propriety were beginning to raise their eyebrows, and to whisper in corners about His Excellency's lack of dignity and decorum.

'There can be no hope', says the Diary, 'of a steady, effective administration, when the two chief personages differ essentially in policy, and take no pains to hide their want of unanimity.' And again: 'Saw Bicheno, and advised him to see and consult His Ex more often. I hope he will, or there will be no chance against that unprincipled, intriguing, ambitious fellow Foster, to whose opinion Sir Eardley defers upon every occasion.'

A little later, after an interview with Sir Eardley, he says:

'He went on in a course of unqualified vituperation against Bicheno. He declared that there was nothing done—that he could get no information from the office; that he could not possibly go on with such a clog upon his government . . .

altogether I have never heard such a collection of inconsistencies and unconnected matters rattled through in my life before. He skims the surface of his subjects, just picking up the light rubbish swimming on the top. He does not appear to me to have the capacity of going deeper, or making himself master of the facts in any case. Judgment, prudent reserve, discretion, are qualities to which he seems an utter stranger. I am told that wherever he is, he carries on this silly gossip with old men, or young wives, or daughters. In short, it is hardly possible to imagine a person so utterly disqualified by an absence of all the elements of wisdom for a Governor. Forster, I understand, says that he will not be here twelve months longer.'

There are other entries in the same strain, relating to the Governor's efforts to curtail expenditure in the civil administration, which were naturally resented; to his relations with Bishop Nixon and the Rev. Ewing; to his troubles with the Legislative Council, which, as you know, culminated in the resignation of "The Patriotic Six"; and to other matters, on which I cannot now dwell. Those of you, who are interested, will find the whole subject of Sir Eardley's administration ably and dispassionately dealt with by Mrs. Kathleen Fitzpatrick, in an article published in 1940 in the Magazine "Historical Studies" Vol. I. No. 1, p. 31.

On August 25th, 1846—three years after his arrival, at a meeting of the Council, Sir Eardley announced to the Members that he had been recalled.

'He was much agitated', says the Diary, 'towards the close of the address, when he spoke of the kindness he had received from many in the Colony . . . . Poor Sir Eardley! Could he have known, before he started from England, that he had been selected by Lord Stanley as the chief instrument in the solution of one of the most difficult of human problems, perhaps . . . . he would have hesitated before he accepted the offered honour of the Government of Van Diemen's Land, and embarked upon the almost boundless and turbulent ocean of difficulties, with which that honour was attended.'

There is no doubt that Sir Eardley's treatment by Mr. Gladstone preyed upon his health and spirits. He became ill, and, barely six months after his recall, died at Hobart, in the little cottage behind the Museum, then occupied by the Governor's Private Secretary. He was buried at St. David's Cemetery (now St. David's Park) and the graceful Gothic Monument to his memory, still standing there, was erected by public subscription.

Sir William Denison

The last of these vice-regal portraits etched for us in the Diary is that of Sir William Denison, who arrived in Van Diemen's Land in January 1847, shortly before the death of Sir Eardley Wilmot. He was a retired Captain of the Corps of Royal Engineers, who had had considerable experience in the construction of docks and other naval works for the Admiralty—an experience of which this Island reaped the benefit during his administration. He was a man of strong personality and was subject to seizures, which probably affected his temper, and may have been responsible for the occasional outbreaks of intolerance and arrogance referred to in the pages of the Diary. The first manifestation of this occurred a few days after his arrival when Mr. Boyes had the unpleasant duty of informing him that he was not entitled to half salary from the date of his embarkation, at which 'he did not seem particularly well-pleased', to put it mildly.

One of the legacies left him by his predecessor was the settlement of the battle raging over the withdrawal of the Patriotic Six from the Council, and the legality or otherwise of the appointment of their successors. The new Governor indicated that he had determined to dispense with the services of the substitutes,

and to call upon the original Members to resume their seats. This gave great offence to the new Members, who felt that 'they had been grossly insulted, and their feelings deeply hurt.'

His next step was to insist upon drastic retrenchments in the civil Departments—a step which made him extremely unpopular:

'If'—says the Diary—'the Public Officers in the Colonies are to depend upon the whim or caprice of each Governor who succeeds to the administration, for permission to continue in the exercise of their offices and the enjoyment of the emoluments belonging to them, then these gentlemen have good reason to complain of broken faith on the part of the Home Government, for, in the case supposed, the Queen's appointment is not worth a farthing. This would be bad enough in England, among a man's own friends and relations, but here, at 16000 miles off, to be deprived of his salary, or even to suffer a diminution of it, is, in nine cases out of ten, absolute ruin . . . .'

'It is really too bad,' he goes on, 'to consign over a parcel of unoffending, loyal men to the mercy of a rude, malicious, captious, petty tyrant. If Mr. Gladstone was constrained, by family or friendly obligations, to appoint such a man, it should have been to a Government upon the African Coast—a Settlement in the Bight of Benin, at the mouth of the Niger, would have been a proper place for his protegé—for, when he had driven away all the civilized beings, he might have found exercise for his heart and mind upon the Niggers. Sir Eardley was a gentle, humane, peaceable Governor, a very House Lamb—compared with the present . . . . Our friend is certainly a sneering, captious, arrogant, tyrannical fellow as ever belonged to the Army.'

Soon after this tirade he tells us that 'The Lt. Governor had an attack of his old complaint, and fell down in the street this morning, almost in front of the Commissarist. He was alone, and strangers picked him up and carried him to a Public House close at hand.'.

The Governor was very angry over the rejection by the Council of The Schools Enactment Bill:

'He said that if he was beaten this year he would bring it on the next, and continue to do so till he had carried it.'

Then the Roads Bill was thrown out:

'O'Connor said it was preposterous for a young man like the Governor to come here, and, before he knew anything of the people or the country, to attempt to cram such a Bill down the throats of the Council.'

Another entry, a few days later, throws further light upon Sir William's irascibility. The Commissioner of the Court of Requests at Launceston (Mr. Knight) had ventured to question the validity of a Bill which had been introduced by His Excellency:

'His Majesty, on looking at the letter, sprang from his chair, assumed a violently hostile attitude towards poor Bicheno, and, as soon as the burst of anger could find utterance, roared out 'DAMN HIM. KICK HIM OUT. TURN HIM OUT INSTANTLY—HE IS A FOOL AND AN ASS.'—After a time, during which the explosive force exhausted itself, Bicheno mildly ventured to question the propriety of turning a man out of office for merely holding a different opinion from His Excellency upon a point of Law—that man, too, being a Lawyer. But nothing for a long time, could soothe him into reason, and he kept repeating 'Damn him. Kick him out. He is an Ass—a Fool.' In the end, after the lava had boiled over and ceased to flow, he listened with some degree of patience to Bicheno's proposal that he should quietly take the opinion of the Law Officers upon the subject, and for the present say no more about it. So ended the last eruption.'

There are, of course, many entries about convicts and their treatment, and on the merits and defects of the Penal System, on which I do not propose to dwell. But the writer's experiences and trials with convict servants are worth recording, because they show, unconsciously, what was probably the attitude of most people towards that unhappy class:

'Both my prisoners servants', he writes, 'took themselves off about one o'clock, and I found them, at four, in the Public House opposite. Sent them to the Watch-house, and next day at the Police Court one was sent to the treadmill for 48 hours, and the other discharged. Called at the Police Office and preferred a charge against the gardener for drunkeness. He was sent to solitary cells for 48 hours, upon bread and water—'A very salutary discipline'—he adds—'and if administered every fortnight would be attended with much benefit to the moral and physical health of most assigned servants.'

There was, of course, another side to the picture, as will be seen from the following entries: 'Having applied to the Assignment Board for a prisoner servant, you are recommended to await the arrival of the next ship, which advice, having no choice, you are constrained to take.

The ship at last comes to an anchor, and, soon after, you have the most satisfactory evidence that your application has not been overlooked in the appearance of a hopeful youth, in a new suit of solemn grey and vivid yellow, and under the charge of one of those respectable characters who are paid 2/- a day by the Government for lounging about the streets all day long, with a short club in their jacket pockets—and twice that amount by the Public House keepers, for passing their doors without looking in, or, being in, for seeing nothing but the colour of the liquor they are about to swallow.

A receipt for the gentleman in the parti-coloured dress being delivered, he is at once upon your establishment.

In your application you had carefully described the qualifications you required—"a House Servant, who could wait at table"—and you are now agreeably surprised by finding, domesticated under your roof, for better or worse, a Cornish ploughboy, who had never seen a Mahogany table in his life, and who was expatriated for attempting a few gaudy bandanas at St. Just Fair . . . . However, you have already upon your establishment two or three other members of the tardigrade tribe, and this last accession to your numerical strength *must* be a House Servant, and *must* wait at table . . . . In about six months from that time, and just as the unfortunate tiller of the Cornish soil—(all rogues being unfortunate when they are caught out)—is beginning, at a fearful cost, to make himself useful—having in the experimental process utterly destroyed a China Dinner Service, chipped and broken £15 worth of Cut Glass, scratched your Plate with sandpaper, and used the furniture brushes in scrubbing, with the aid of soap and water, the French polish off your tables and sideboard—you receive a Note from that very respectable Personage, the Principal Superintendent, requesting you will be good enough to dispense with the young man's services the Government having it in contemplation to make him a Constable, for which situation he has been strongly recommended to the Chief Police Magistrate . . . . After an interval of a few months, during which your family must wait upon one another—if they must be waited upon at all—you are exposed to new trials of pain and patience . . . . At the end of the year, if you keep any accounts, you come to the conclusion that, after all, the unpaid services of compulsive labour are not so desirable, in point of economy, or, indeed, in point of convenience, as you have been led to expect, notwithstanding the very clever Despatches of Sir George Arthur to the contrary, written before his Title was conferred.'

And here are a few scenes which were not infrequent in the domestic menage: '"Regatta Day". Servants all drunk, of course, and the gardener gave Ann a thrashing in the kitchen, to prove his love for her, and enmity to a supposed rival. The gardener and the women servants were all drunk, and would not go to bed till 3 a.m., in spite of anything their Mistress could say to them . . . Servants drunk again. Williams, the Constable, whose wife was drunk and would not go to bed, finding his patience exhausted, got up about 11 O'clock, dragged her out of the kitchen, where she was rattling away with Davis, and gave her a good thrashing.'.

And the following incident, which shows the moral effect of the Convict ship 'Anson', on which female prisoners were kept pending Assignment: 'About 11 o'clock there was a tremendous uproar in the kitchen and about the door. A young woman, not long in the Colony, and only one little month from the wholesale "Abstergent of Vice" the Anson, had become most heroically drunk. Braving all the authorities, the Police in particular, there she was, keeping Benjamin, Thomas, and the gardener, at arms length, and the kitchen to herself—screaming, dancing, howling and insulting a poor little Constable, who had made his appearance, with a Musket, to take her away. I walked up and down the verandah to prevent her entering the house, and it certainly did occur to me that she every now and then compelled the little Constable, Musket and all, to join in her gymnastic exercises. I was obliged to send for more assistance, but it was upwards of two hours before they reached the Watchhouse. They were obliged to lash her into a wheelbarrow, and, while in transit, the whole Welkin rang with her shrieks and imprecations. When before the Magistrate next morning, Esdaile, the District Constable declared that in the course of twenty years he had never heard such language, or anything approaching it, proceed from the mouth of a woman. It must be remembered'—he adds—'that she had just become entitled, under the excellent regulations of the "Anson", to the privilege of going into private service. What a valuable character to have in a family of young ladies and gentlemen.'

(Next day, the unfortunate woman got three months in the Factory—two with Hard Labour, and one in a Solitary Cell.) . . .

And there are a host of minor characters who play their parts in this colorful Pageant of Van Diemen's Land Society. One after another, from the Chief Justice on the Bench to the convict servant in the kitchen, they have their exits and their entrances, and sometimes the writer takes us behind the scenes, and shows them to us in their dressing rooms, without their make-up—a sorry spectacle indeed. We see the Machiavellian Montagu and his brother-in-law Matthew Forster—once the dominating figure of his day, but now only a name upon a crumbling tombstone in a disused Cemetery: James Ebenezer Bicheno, the genial Colonial Secretary—more like a jovial farmer than a politician—fat and smiling, fond of good living and good company, ever ready to oblige with a song, and annoyed with his portrait by Bock, which he complained 'made him look like a Bishop, or a stall-fed ox, dosing after a meal.'

And Bishop Nixon, fussing over the Exhibition of pictures at the old Customs House (the first exhibition of its kind ever held in Australia), bustling about, running up and down the stairs, chattering to everybody, as if his reputation as a Connoisseur of the Fine Arts depended upon its success; or at other times irritating Mr. Boyes by his neighbourly habit of borrowing his horse whenever he had any heavy work to be done at Runnymede, though he had horses of his own, eating their heads off in his stables.

And Joseph Allport, the great-grandfather of our esteemed Vice-President, of whom he says this:

'Certainly the most able, most experienced, and most successful manager of all disputed cases. I would prefer him professionally to any of the Bar. He is remarkedly clear-headed, and possesses an inexhaustible stock of impudence and self-sufficiency, which nothing can put down.'

And Captain Wentworth, of the 63rd Regt., making a scene at Government House, because his hat had been crushed, and, forgetting where he was, abusing the House, the Governor, politics, establishment, Colony, and everything else, until Capt. Forth had to intervene for the honour of the Service and of Vice-Royalty; And Col. Logan, also of the 63rd, with his interminable, pointless stories at the dinnertable, stifling all conversation, so that even professional talkers had to give in, either in despair or disgust; 'Holy Willie' Bedford and his son, the Doctor: G. W. Evans, the Surveyor-General: the artists Glover, Bock, Simpkinson and Wainewright—and a multitude of other figures, who flit across the stage and vanish into the wings in bewildering succession.

But time is running on, and I must pass to other aspects of social life depicted in the Diary.

Among the duties entailed by Mr. Boyes' official position was that of attending parties at Government House, and his description of some of these is worth quoting:

At an afternoon given by the Arthurs 'there was a great assemblage, over 200. The front verandah was latticed in, and the open spaces of woodwork filled up with roses, geraniums, and native shrubs—and the company on both sides of the tables extended the whole length. The Governor, after his health had been drunk, rose and made a neat speech about friends and enemies—delicately allusive to the manner in which some few of his hearers had been in the habit of treating him.'

At another, given by the Franklins:

'An evening party, about 450 present; came away about 2 o'clock heartily tired with the bad supper, bad dancing, stupid people, and the clouds of dust.'

And the Birthday Ball of the Denisons:

'It was much crowded, very dusty, indeed almost to suffocation, and altogether very disagreeable. The young women were extremely plain, and such dowdies—where could they have come from? From the Mother Country, I suspect, or else from the far west of the northern side of the Island—on the wrong, uncivilised side of Deloraine. They were never born in the reclaimed districts.' At another—'The Young Beauties, in White Muslin', were sitting or reclining in clusters about the room, fresh and fair as a rich bed of roses, raising their delicate heads above the light wreaths of a June snowfall.'.

And while on the subject of dress,—here is an amusing comment on the recently introduced fashion of wearing a bustle, taken from a letter written to his wife in 1831—(she was then in England.)—'By the bye, do you wear a bustle? This article of female attire excited considerable surprise and speculation among the Goths and Vandals of Van Diemen's Land, when it made its first appearance among us. We do not at all understand upon what principle of Political Economy so extraordinary a protuberance had proceeded . . . .'

Private entertaining was much more frequent then than it is to-day, and dances and dinner parties were common. Here is a description of a fancy dress Ball given by Mrs. Alfred Stephen, wife of the Attorney General: 'Cartwright' (the Solicitor), 'upon my addressing him in Spanish, taking him to be intended for a Muleteer, told me very candidly that he was a Swiss Peasant, but spoke no language but English, and that, I discovered, only indifferently. Allport' (Joseph) 'was admirable as a Chinaman . . . A Mr. Nicholas exhibited himself in a Court

dress of George I., with tin buttons on his coat as large as breakfast plates. There were Scottish Chiefs, and Hungarian Brothers, and, by way of experiment, a few had attempted the disguise of *Gentlemen*, in which it is clear they failed, since they were invariably known at a glance.

But the treat of the evening was Moore, the Collector of Internal Revenue—a fat, clumsy-built man, with large head and red face. His daughters had dressed him as a Spanish Grandee, in heavy, woollen garments and cloak, topped by a broad-brimmed hat of black, glazed Calico, to look like Satin, and an unwieldy plume of white ostrich feathers. Owing to the heat, greasy matter oozed out at every pore, and his face seemed to have been anointed with cocoa-nut oil. He could not wipe it, for fear of wiping off his moustachios and blackened eyebrows . . . . It is some time since I laughed so much. I left at 4 a.m. and at that time fresh candles had been placed in the Chandeliers, and they were whisking off in a waltz.'.

Then there is a dinner at Dr. Barnard's: 'Two of the men, who had miserable voices, sat for at least two hours before the piano, howling forth deplorable ditties, which they pretended to be beautiful duets from the Operas of "I. Puritani", "Don Giovanni", Il Barbiere di Seviglia", &c. No strains I ever heard were half so dismal and dolorous, not even those of a dog baying to the moon, or owls making their complaints to it.'

And an evening party at the Rev. Ewing's at Newtown: 'Among others present were Mrs. Fereday, the Tasmanian Nightingale, and her Showman—a tall, elderly, round-shouldered Engineer, Capt. Twiss, to wit—and his Lady. Everybody seemed exhausted with the civil things they were obliged to utter, after cudgelling their brains for something new. Mrs. Ewing, in despair, borrowed a complimentary speech from the Bishop, and found it answer very well. These Stars, by throwing every other voice into insignificance, and discouraging all attempts, by the way they excel, spoil the parties, and make the evening pass as stupidly as if it were a funeral, rather than merry-making.

And here is a picture of one of the young dandies of Hobart Town:

'One of the W—s dined with us—a conceited, empty-headed young man—all shining in silk stock, with silk lining to his coat, satin waistcoat, and oily hair, together with a liberal sprinkling of gold pins and chains. These Colonial chaps—"Gumsuckers", as they are not inappropriately called—are my aversion—puffed up with the success of his father, since he quitted the boot and shoe line in England—without education, or manners, having no ideas beyond a partial and faint glimmer of something supplied by another—without conversation and without the slightest knowledge of his defects.' . . .

Then comes an entertaining description of a sitting of the Court of Quarter Sessions, presided over by Mr. Joseph Hone[1]; (Master of the Supreme Court):

'He appears to know as little about the Law as any of us. He is extremely slow and tiresome. The diabolical faces that he is constantly exhibiting, the awkward, abrupt manner of addressing the witnesses, Counsel, and prisoners—the contraction of the fingers of the right hand, while at the same time his arm is raised as though he was about to claw the Crown Solicitor's pate—altogether he is the constant laughing-stock of the people, many of whom go to the Court for no other purpose than the amusement afforded by the Chairman, which occasionally is quite equal to that of Punch and Joan.

---

(1) The following Inscription is to be found on the Tomb of Joseph Hone in St. David's Cemetery.—'For the period of 37 years he held various important judicial and magisterial appointments in this Colony. of which he discharges his duties with exemplary industry and ability, and spotless integrity. In private life he was an example of the domestic virtues of unenlightened and Christian charity.

In pace quiescit'

The witnesses—a Mr. and Mrs. M— of New Norfolk—each weighing about 23 stone, came by separate vehicles, being too bulky to travel in the same gig. Hannah Shaw—tall, thin, and scraggy—common, evidently, by birth rejoiced in the interior of a straw bonnet of most ample dimensions, tastefully, and somewhat elaborately, decorated with deep blue ribbons. A shawl was thrown carefully over her shoulders, resplendent with flowers of gold and scarlet. 'She knew Mr. M's stockings by the size; they would not fit anybody else—she never washed such large stockings as Mr. M's.' . . . Another case for stealing a handkerchief:

'The Prosecutrix—one of Egypt's dark daughters—with sharp features, appeared in a white cap, secured under the chin with a black riband. A Mrs. Elizabeth Clark was very politely handed up to the witness box by her husband. The lady, who had been unhappy in the preservation of her teeth, wore a light dress, richly flowered—the upper portion concealed by a black silk veil and tippet. She had on a straw bonnet, tied with pink ribbon, white gloves, and a Cambric pockethandkerchief in her hand. A parasol with a mother-of-pearl handle completed her equipment.' . . .

Of the general tone of Society he has little good to say:

'The people of this Colony very much resemble the Americans in their presumption, arrogance, ignorance, and conceit. They believe they are the most remarkable men on the Globe, and that their little Island "whips all Creation". They are all Radicals of the worst kind, and their children are brought up in the belief that all Governments are bad—that they are deprived of their rights, and that they are ground and depressed by the Mother Country, and mocked by the Officers sent out from England to rule them. Their views are all of the narrowest and most selfish kind. They are incapable of any generous sentiment, and ever ready to impute the basest motives to their fellow colonists. Lying, slandering, envy, hatred, and malice are their daily aliment, and the consumption is incredible.'.

Duelling had not altogether gone out of fashion in those days, and he gives us an amusing description of one such encounter:

'Murray—an old, brave military officer . . . . appeared on the ground in a *shooting jacket*—certainly a very appropriate dress.

His antagonist (Moore) in *deep Mourning*—equally appropriate, as signification of his feelings. The latter had made his Will, and on his way to what his apprehension looked upon as a field of slaughter, earnestly commended his wife—six feet high—and his two sons and three daughters, fast rising to the same altitude, to the care of the little Doctor' (Bedford) . . . 'Moore had the first fire, took it, and missed. He had then to wait a second, with evident anxiety, while Murray deliberately raised his pistol, took his aim, and sent the ball with a crack—into the stump of a tree, a yard or two distant from his opponent. This caused Moore to jump, not being quite certain whether the deadly bullet had entered the body of the tree, or *his own* . . . . Moore expressed himself as quite satisfied with the result of the hostile meeting, and left the ground a different man from that he had come.'

Conclusion

We must bid farewell to this absorbing Commentary on Old Van Diemen's Land. I cannot close its pages, however, without quoting a passage, which reveals an aspect of the writer's character, of which we have hitherto heard little. It is his rhapsody over the view from the top of the Domain at Hobart:

'I looked down' he says 'upon my own residence, and could see my children nay, hear their glad voices, as they pursued their mimic games through the walks of the garden . . . .

The sun was sinking fast behind a lofty hill upon my left, throwing golden gleams upon the green ridges of the cultivated grounds that were already draped in the mantle of Spring, and upon the precipitous masses of rock and wood-covered wilds that bound the opposite side of the river. Before and beyond the tongue of land that forms the Government Domain, the placid water lay deep below, without a ripple upon its surface. The course of the stream was traced for miles, here and there showing its cool, silver face as it made its tortuous way among the island-looking shores, till it was lost in the blue, conical hills, that with their tender outline terminated the view. A fine mass of shadow, lay beneath the sunny sky, broken here and there, by the cold green fields, from which the light of day was fast receding, and by the thin blue vapour that crept lazily up from beneath the trees, masking, here, the Mansion of the rich Banker who holds pecuniary dominion over a moiety of the Island, and there the splendid Asylum, which a humane and wise Government has erected for the young and destitute orphans . . .

A few years since, the sun went down as gloriously, the waters were as placid and silvery, the air as soft and balmy. Mountains and valleys were in the positions they now occupy; but the foot of civilized Man had never trod the gloomy, interminable forest. Nature had then, apparently, been lavish of her treasures in vain—the Kangaroo, the Emu and the Opossum afforded, perhaps, a precarious subsistence to the native children of the woods . . . . But, if there were less Happiness, according to our notions of its constituents, there was, no doubt, infinitely less Misery.'

The Diary of the Rev. Robert Knopwood, 1805-1808[1]

1805 *Dum Spiro Spero*
1806 Whilst I breath I have hope
1807 *Sic Fortis Hobartia Crevit*
1808 Thus by industry Hobart Town increasd

Revd. Robert Knopwood
Chaplain

Hobart Town Derwent River Van Diemens Land January 1 1805 A'sia 1806[2]
3 Feb 1805 Mr Cheese

England 1805	Van Diemens Land, A'sia
January Flatheads	July
February	August
March Mackerell	September
April	October
May	November
June	December
July	January
August	February
September	March
October	April
November	May
December	June

N.B. The difference of Time at Hobert Town Van Diemens Land and Greenwich is Nine Hours forty seven minutes earlier than There.

January 1805 — 1 Remarks Hobert Town River Derwent Van Diemens Land A'sia .

Tuesday C. Sign NEW YEAR — 1 am at 11 there was a general Muster of all the Prisoners in the Colony, it being New Year's Day. at 4 pm Mr. Harris and self dind with His Honor Lt Governor Collins, who gave us a very excellent dinner
Lt Lord and Powers had another unfortunate dispute

Wednesday C.S. London — 2 am this morn two men Forshaw and Munden began to put my cottage up at my Garden. At 5 pm all the Civil and Military/except Lt Lord of the Royal Marines were at Mr. Harris Monthly Dinner. Lt Lord being under an arrest by order of the Lt Governor.

(1) Prepared for publication by W. H. Hudspeth and S. Angel from the original manuscript in the possession of Miss Mabel Hookey, Rokeby, Tasmania.

(2) Page headings sometimes extend across two pages. When this occurs they have been consolidated. When they occur in the middle of a paragraph they have been omitted. (Edd.)

Thursday 3 am Mr. Harris and self engaged in taking Examinations. At 2 pm I walkd to the Farm and returned home to dinner at 5 pm at 10 some lightning from N.E./At 4 am; the House of Joseph Michael a Jew caught fire and was consumed.
C.S.
Justice

Friday 4 am at 10 Mr. Fosbrook and self went in my boat to the opposite side of the river. At 5 pm Mr. Fosbrook and George Collins (the Gov. son) dind with me.
C.S.
Herdsmans Cove

Saturday 5 am moderate and fair. At 1 pm I took a stake with Mr. Fosbrook and we went across the river. A Pigeon shooting I killd 4 Mr. Fosbrook Servt 2. in the Eve we returnd.
C.S.
Berry Head

Sunday 6 am the Wr so very hot that Divine Service could not be performd. At 4 pm I dind with His Honor the Lt Governor and in the Eve calld upon Mr. & Mrs. Groves The Thermomiter at 12. 87. ½
C.S.
Brixham

th
January 7 Remarks Hobart Town River Derwent Van Diemens Land

Monday 7 am at 7 Mr. Groves and the Gov Son breakfasted with me. At 8 we walkd to Mr. Millers Farm where I had 2 men cutting watling. at 12 I brought the sticks down in my boat 5 pm Messrs. Harris Janson, Bowden and self dind with Mr. Fosbrook.
C.S.
Sandwich

Tuesday 8 am Employd about my House and Garden Ground.
C.S.
Dunnoge

Wed. 9 am The day very hot, at 12 the Thermomiter was 91; ½ 2 pm the Governor and self walkd to the Farm where we dind and in the Eve returned home. 8 Thunder and Lightning with Rain. The Governor gave the Name of the Town at the Farm New Town
C.S.
Yarmouth

Thursday 10 am the day very windy with rain at intervals. the Eve very cold.
C.S.
New Town

Friday 11 am the day very hot with a N.W. wind. at 2 pm Mr. Groves and self went to Risdon in my boat and on return we landed on the Farm side and walkd home to Dinner very late Mr. Clark gave me 2 coucumbers which we had for Dinner at Mr. G's
C.S.
Monckton

Saturday 12 am the day very hot 3 pm Mr. Hambleton dind with me. At 5 Mr. Harris informd me of a letter that had passd between him and the Lt Governor
C.S.
Shoreham

Sunday 13 am at 11 I performd Divine Service and Preach the Sermon
C.S. on Discontent Censure. after which the Governor returnd
Weymouth me thanks before the whole congregation for the excellen sermon at 5 pm I dind with Lt Johnson

January 1805 Remarks Hobert Town River Derwent Van Diemens Land

Monday 14 am at 7 the Governors Servt came and informd me that
C.S. there was a ship in sight. 10 Mr. Humphry Mr. Janson
Exmouth and self went in my boat across the River where we see her lay at anchor below Ralphs Bay on the east side of the river
1 pm the Captain came on shore and waited on the Governor 3 the Gov sent for me and invited me to dinner to meet the Captain whose name is Barber the ship name Myrtle. An extra East India ship from Bengall. laden with spirits rice and Sugar. This day we have been two years on the Establishment.

Tuesday 15 am at 11 Mr. Groves and self went in my boat across the
C.S. river to see for some Thatch for my house at 2 pm we
Barber returnd and the Gov was askd me to meet Capt Barber but I was engaged Lt Johnson and his son George dind with me

Wednesday 16 am at ½ past 7 the Myrtle Capt Barber and extra company
C.S. ship arrived in the Cove and saluted the Gov. with 11 Guns.
Lime Engaged all the Morn upon business as a Magestrate at 1 pm Capt Barber calld upon me, but I was upon business with the Lt Governor. at 4 rain with Thunder and very hot at intervals.

Thursday 17 am Continual rain all night and in the morn exceedingly
C.S. warm ½ past 3 pm Mr. Harris dind with me, and in the
Plymouth Eve I drank tea at the Governors. Capt Barber there.

Friday 18 am the day very hot. at 12 Capt. Barber calld upon me.
C.S. pm employd very busy about my new House.
The Queen The Thermomiter 82 in the shade

January 1805 Remarks Hobert Town River Derwent Van Diemens Land

Sunday 20 am the morn very windy and rain at 4 pm Capt Sladden
C.S. Mr. Janson Fosbrook Bowden Humphry and Lt Johnson
Saltash and self went on board the Myrtle Capt Barber, to take a sandwich at 3 we came on shore and we walkd to the Farm. At 7 Capt Barber Mr. Bowden and self came down in his boat and supd on board

Monday 21 am the weather fair and hot. at 4 pm Capt & Mrs Sladden
C.S. Mr Fosbrook Humphry and self with Lt. Johnson dind on
Penryn board the Myrtle.

Tuesday 22 am the morn very hot Capt Barber calld on me and we
C.S. went a shooting for an Hour—3 pm the Governor Capt
St. Ives Barber and self went in his boat to the Government Farm
where we dind with the Governor and in the Eve walkd
home.

Wednesday 23 am this morn I breakfasted with the Gov. and Capt. Barber
C.S. at 4 pm Mr. Harris and George Collins the Gov son dind
Helstone with me. at ½ past 11 pm the Gov sent for me when I
was in bed and we sat till 2 am upon business. Continual
rain all the Eve and night.

Saturday Jan. 19th am at noon showers at 3 pm the Governor and self went in his boat on board the Myrtle Capt. Barber. and he saluted the Gov with 11 Guns we dind on board and Mr. Harris with us at 8 we came away and the Hands were all upon deck and gave His Honor the Governor three cheers when we came away in the boat

State of the weather on Saturday the 19 of January 1805

At 8 am	At 5 pm
Fair, Wind n. Ther. 79½	Wind n. Ther. 92
At noon	At 8 pm
Showery, Wind N.E. Ther. 75	Fair Wind N. Ther. 62
At 4 pm	
Fair, Wind N. Ther 86	

January 1805 Remarks Hobert Town River Derwent

Thusday 24 am Very cold weather with rain at 5 pm Capt Barber
C.S. Mr. Fosbrook the Govnrs son and self dind with Mr.
Padstow Harris—the Eve very wet and cold.

Friday 25 am continuel rain and wet Wr. all the morn. At ½ past 4
C.S. Do Wr rain and wind till 12 pm Sent my man to Risdon
Bideford with my dogs

Saturday 26 am rain till 9 am at 11 the weather began to clear up.
C.S. ½ past 2 pm My man returnd in my boat with 4 Kangaros
Lundey which my dogs killd at Risdon. 4 Capt. Barber Mr. Harris
and self dind with the Governor.

Sunday 27 am the Morn very cloudy and the Ground so wet after the
C.S. rain that the Govnor declind having Divine service per-
Severn formd. At 4 pm Mr. Nichols first Mate of the Myrtle and
self dind with the Governor.

Monday 28 am the weather more moderate. at 4 pm Captain Barber
C.S. and Mr. Nichols dind with me.
Pembroke

Remarks Hobert Town River Derwent Van Diemens Land 1805 January

Tuesday 29 am moderate and fair wr. At 4 pm Capt. Barber and self
C.S. dind with his Honer Lt. Gov Collins.
Radner

Wed— C.S. Monmouth 30 am at 10 the Masons tild in my Pigeon House the first tild House in the Colony. The morn damp. At 10 the Lt Gov desired me to accompany him with Capt Barber to Sandy Bay ½ past we walked with him there and returnd in his boat. at ½ past 1 pm I found a very unkind letter from the officers by reason that I did not attend a meeting of them that morn. 4 pm I dind with Capt Barber and in the Eve Supd with the Gov. Rain and little Wind.

Thusday C.S. Dolgally 31 am continual rain all night and morn. at 12 clear. ½ past 1 pm I took a walk with my Gun and killd a couple of bronswing pigeons. 4 Capt Barber dind with me.

February 1—

Friday C.S. Holy Head 1 am at 9 the Governor calld upon me and we walkd to see my Cottage. at 11 I attended the meeting of the Magistrate upon Whiteheads business. At 4 pm Capt. Barber and self dind with His Honor the Lt Governor.

Saturday C.S. Stafford 2 am the Wr, moderate. At 11 Capt Barber calld upon me at 3 pm George the Lt Gov Son and self took a walk to the Sandy Bay. I took my gun and killd a partridge 3 Bronswings Pigeons. At ½ past 6 we returnd and he dind with me.

Sunday C.S. Flint 3 am the morn very hot. at 11 Performd Divine Service. the Gov. and self attended At home all the afternoon and Eve.

Monday C.S. Mano 4 am The morn very hot. at 4 pm Captain Barber dined with me at ½ past 5 we went in his boat across the River to shoot Pigeons. In the Eve I supd on board the Myrtle. Capt Slad. & Mr. P. Har. refused to act as Magistrates

Tuesday C.S. Burton 5 am the morn hot at 6 pm a Boat came up with Mr. Collins from his ship the Sophia from Sidney. He brought Feamale Prisoners with him for this Colony

Wednesday C.S. Collins 6 am the day hot. at 2 pm the Lt Govner and self went in his boat on board the Sophia Capt Collins. the Lt Gov Daughter from Port Jackson came down and was on board when we were there the same Eve all the Feamale prisoners landed. I dind with His Honor the Lt Governor

Feb. Remarks Hobert Town River Derwen Van Diemens Land 1805

Thursday C.S. Wigan 7 am at 10 I walkd to the Farm with George Collins the Lt. Gov Son and calld at Martha Hay's. This day I was to have dind with the Lt. Gov. but on my return I receivd a very unkind letter from him. In the eve he sent for me

the Lt. Govrnr afterwards repented that he had believed Mr. Collins who was a bad man		and I took tea with him. Mr. Collins of the ship Sophia dind with the Lt Governor—Capt Collins of that Sophia had told the Lt Governor a great many lies which was proved so by Capt Houston on his arrival in H.M. Ship Porpois.
Friday C.S. Rippon	8	am at 10 all the officers upon the Parade this morning at ½ past ten I went to Mr. Harris by request of Governor Collins The Governor made it up with all the Officers. Lt Lord came out of his Arrest by order of the Lt. Governor Collins.
Saturday C.S. Wetherby	9	am at 3 dind with Capt Barber and we went over on the other side of the River a shooting. I supd on board and George the Gov son with us.
Sunday C.S. Hornby	10	am at 10 I went to the Farm and performd Divine Service there returnd home to Dinner. The Governor's son dind with me In the eve I calld upon Mrs. & Mr. Groves
Monday C.S. Sheffield	11	am at ½ past Ten the Magistrates all met at Mr. Harris upon business—myself Capt Sladden and Mr. Harris,—the last two gentlemen having chose to act again. At 4 pm Capt Barber of the ship Myrtle dind with me
Tuesday C.S. Stockton	12	am receivd letters by the Sophia from Capt. Rhodes and Lt. Moore at ½ past 10 the three Magistrates sat on business respecting Andrew Whiteheads ill conduct to Mr. Fosbrook—4 pm I went on Board the Myrtle Capt Barber and dind and supd—the hotest day we have experienced this Season.
Wed— C.S. Morpeth	13	am Engaged all the morn upon business till 1 pm when I went on board the Myrtle to speak to Capt Barber. I returnd home to dinner. At 2 am G. P. H. accompanyd with W. I. Anson came to my Marque while I was in bed. Mr. H. requested that I would marry him as this morn at 8. He was very forward in spirits. I told him that I could not marry him till I had askd the Banns. the Marriage postpond till Sunday next.
Feb. 1805		Remarks Hobert Town Van Diemens Land
Thursday C.S. Shields	14	am at 10 I went on board the Sophia Capt Collins and receivd 2 Quarter Casks of Port Wine and some fruit trees
Friday C.S. Wigton	15	am being very unwell I continued at home all the day. In the Eve Capt Barber came and smoaked a Cherrout with me

Saturday 16 am at home all the morn. 4 pm Capt Barber and Mr. Nicols his first officer came and dind with me. Mr. Harris calld and took some Wine. Mr. Groves smoakd a pipe with me At 8 the Drum beat to arms. It was supposd that the corn Stacks were set fire to by reason of the great fires. It was only the Natives.
C.S.
Cape Barron

Sunday 17 am at 10 I went to the farm and Married George Pirdeaux Harris Esqr to Miss Ann Jane Hobs of Newtown. at 4 pm Capt Barber dind with me, and at 8 pm took leave and went on board. Lt Johnson was sent on board with a party of men as the Lt Gov had information that many of the Prisoners were going to effect their escape by the Myrtle. desertd from the Camp Thos Green James Price James Wright
C.S.
Whitby

Monday 18 am at 4 saild the ship Myrtle Capt Henry Barber for Norfolk Island and to the N.W. coast of America. At ½ past 11 Groves and self in my boat went to Risdon for my man and we cut some spars. the wind was very fresh when we came away.
C.S.
Myrtle

Remarks Hobert Town 1805 Feb.

Tuesday 19 am a Boat returned from the Myrtle with Lt Johnson who went on board on Sunday Eve with a party of Men the Lt Gov. being informed that some of the Prisoners would escape in the ship if possible. At 4 pm the Lt. Gov had all his officers to dine with him. Prisoners absent from the Hobert Town. Tho Green, James Price,—Wright Prior to the Lt. Gov. giving the officers a dinner this day one of them waited upon him and informd him they feard he had forgot his Promise for them to dine with him.
C.S.
Belfast

Wednesday 20 am at 11 Mr. Groves and self went in my boat across the river at 5 pm we returnd with a great many poles &c for Building. Frequent showers.
C.S.
Down

Thursday 21 am Moderate and fair Wr. at 4 pm I went across the water for my Man Gains who was a Kangarroing. he killd a very large one. At 6 pm I went and took a pipe at Mr. Groves Mrs. and Mr. Powers were there.
C.S.
Coleraine

Friday 22 am at 10 I struck my Marque and had it Pitched near the cottage. at 4 pm Mr. Groves and his son came past and they took a Kangaroo Stake with me
C.S.
Hull

Saturday 23 am the day very hot with a N.W. Wind at 5 pm the Government Cutter was sent down to Sandy Bay where the Body of James Price was found. he was seen by the stock keeper
C.S.
Barton

Feb. Remarks at Hobert Town 1805

Sunday 24 am at ½ past 10 the morn was so very hot from a N. West
C.S. wind that the Lt. Gov declind having Divine Service
Trent performd. 2 pm I buried the body of James Price who deserted from Hobert Town on Sunday Feb. 17 in comp
Little Nettle had 7 with Tho. Green and James Wright. This morn I Break-
Puppys fasted and Dind in my cottage though not finished the morn was so hot.

Monday 25 am at 10 I married Mich. Mansfield and Sophia Chilvers
C.S. in my cottage.
Lyne

Tuesday 26 am at 11 by request of the Lt Govnor I went to New Town
C.S. where I examind Wm. Parish &c. the Lt Gov came to the
Berry Farm to me.

Wednesday 27 am at 11 Mr. Groves and self went to Risdon in my
C.S. Boat where I left my man with my Dogs we dind in the
Colchester Woods and returnd home in the Eve
the Lt. Gov. D . . . came on shore to remain with him.

March Remarkes Hobert Town 1805

Thersday 28 am the day very fine pm Mr. Groves calld on me
C.S.
Malden

Friday 1 am at 9 my Man Gaines returnd from Risdon and killd
C.S. three Kangarros and 1 Emew—at 5 pm Mr. & Mrs.
St. David Powers and Mr. & Mrs. Groves calld upon me. This Eve I sent His Honor a peice of Emew.

Saturday 2 am in the Morn I sat upon business as Magistrate. pm
C.S. continued at home writing
Dispatch

Sunday 3 am this morn early the Marque of G. P. Harris Esqr—
C.S. the Linings of the Marque was cut, when Mr. and Mrs.
Grantham Harris was in bed and a large Cask of Spirits was taken away. At 10 the Weather was so wet that we had not Divine Service performd.

Monday 4 am at 8 this morn the Sophia fird a Gun as signal for
C.S. sailing at ½ past Lt. Lord and Mr. Humphry went on
Newark Board at 11 the Magistrates sat. 12 Lt. Lord and H. came on shore

finisd my letter for England and Pt. Jackson

Tuesday 5 am at 8 moderate and fair Wr. ½ past 2 pm Mr. Groves
C.S. dind with me and I went out a shooting at 3 came to
Patterson anchor the Nancy schooner from Pt. Dalrimple. As she came past Oyster Bay she took up 3 men that belonged to

the Sophia that were sealing there. The Natives had set fire to their House and robbd them of their provisions. Had not the Nancy came they must have pershd. The Natives destroyd about 2000 skins which they had taken since they were on the Island.

Remarks Hobert Town March 1805

Wednesday 6 am the Monthly Club was held at Mr. Bowdens. This
C.S. day I got a great many Poles for my Garden
York Town

Thursday 7 am at ½ past 10 I went out in my boat to cut some thatch
C.S. at 11 the Sophia made a Signal with a gun and got under
Good Voyage weigh with a fair breeze down the River. At 2 the wind changed and drove my boat a shore, loaded with Rushes, and with very great difficulty We got her off again. We arrivd safe at Hobert Town at 4 pm ½ past 7 my servants Kitchen caught fire and was entirely consumed with a very fine stove and other things lost all my fruit trees in the Garden

Friday 8 am the whole of the Day very hot with a N.W. wind—
C.S. pm Mr. Groves calld on me the fire the Eve before
Doncaster spoild many valuable plants in my garden and about 400 paling

Sat— 9 am at day light this morn saild the Nancy schooner for
C.S. Kings Island at 11 a boat arrivd from the Sophia Mr.
Chester Collins. The wind had blown so much that he could not get out of the River. pm every appearance of Rain.

March Remarks Hobert Town March 1805

Sunday 10 am continual rain all the morn. Divine service could not
C.S. be performd pm more moderate. In the Eve I went to
Thetford Mr. G. and stayd late.

Monday 11 am moderate rains, at 11 sent my Men after 2 Kangarros,
C.S. pm in the eve they returnd and killd a couple.
Banbury

Tuesday 12 am at 11 I walkd to the Farm and returnd home late to
C.S. dinner
Harwich

Wed. 13 am very busy about my garden
C.S.
Thames

Thursday 14 am this morn I breakfasted in my Cottage and employd
C.S. in removing some of my things there. at 11 I went across
Kingston the water with my boat to put Gains with my Doggs across. Mr. G.—and self dind in the Woods. we returnd at 6 pm

and this Eve I slept at my Cottage for the first night having been sixteen months three weeks and five days in my Marque exposed to the inclemency of all Weathers, not only that but a Marque which when we had them first were not new. Add to it; the continual Robberies which were daily Committed in the camp by the convicts and the servants all of which I was subject to.

March — Remarks Hobert Town River Derwen

Friday 15 C.S. Shaftsbury — am this morn the Spirits were issued to each officer the quantity that the Lt Gov. allowd them to take. pm the Masons &c being very busy about my House I went to Mr. G. and in the Eve came there Mr. & Mrs. P. and Miss Collins, afterwards His Honor the Lt. Gov. He took a glass of Spirits with us.

Saturday 16 C.S. Dublin — am at 11 Mr. Groves and self walkd to the Farm. at 4 pm we returnd and he dind with me.

Sunday 17 C.S. Ireland — am the morn cloudy at 11 Performd Divine Service His Honor Lt Gov Collins attended the Sermon on Conscience 12 Chapt Hebrews 24 verse, in the afternoon Mr. & Mrs. Groves calld upon me.

Monday 18 C.S. Ulster — am at 11 Mr. Harris and self engaged upon Business.

Tuesday 19 C.S. Leitrim — am at 10 I walkd to the Farm and returnd to Dinner. pm at 7 I went down to Mr. Groves and met the Lt. Gov. there.

Wed. 20 C.S. Collins — am at 7 His Honor the Lt Governor and Mr. Harris the Surveyor went and examind a peice of water near Frederick Henry Bay. at 2 pm they returnd and at 5 when I calld for the C. Sign the Lt. Gov. invited me to his House where I set some time.

Remarks Hobert Town River Derwen

Thursday 21 C.S. Wexford — am at 10 Mr. Groves and self walkd to Millers the Setlers—I return at 4 pm to dinner.

Friday 22 C.S. Cork — am at home all the morn pm very warm weather.

Saturday 23 C.S. Longford — am this morn sent Salmon and Gains out with my Dogs and they returnd at 9 with a couple of Kangarros at 10 engaged upon Business. At 3 pm I deliverd the report in to His Honor the Lt Gov. when he was walking at Mr. Powers Garden with his Daughter and Mr. P. the Lt Gov asked me to do duty at New Town.

Sunday C.S. Clare	24	am at 10 I went to New Town and performd Divine Service and returnd—I stayd at home all the aft and eve, fearful that my Kangarro Dogs should be taken away It was the intention to robb me of my dogs.
Monday C.S. Shannon	25	am this morn was missing from Hobart Town the following Prisoners—James Ballance, John Rogers, Henry Rice, Robt Hays, Richd Kidman—they took away some Doggs pm in the eve I spraind my ankle very much
Tuesday C.S. Kerry	26	am at home all day with a bad ankle
Wed— C.S. Castlebar	27	am at home all day—pm at 11 the wind began to rise which increasd very much
March 1805		Remarks Hobert Town V.D.L.
Thursday C.S. KilKenny	28	am at 1 it blew a very hard Gale of wind which continued till 6. At 8 more moderate. pm at 4 moderate rain.
Friday C.S. Trim	29	am at 1 pm I took my boat and went across the River to cut posts for Railings
Saturday C.S. Athlone	30	am at ½ past 11 this morn and at 2 pm but more perticularly at 2 Mr. G . . . s thought he felt his House shake similar to an Earthquake.
Sunday C.S. Ross	31	am the Wr. rainy at intervals that Divine Service could not be performd.
April 1805		Remarks Hobert Town V.D.L.
Monday C.S. Dundalk	1	am at ½ past 10 Mr. Harris and self went to the Farm upon business. I returnd to Dinner late. pm the Governer din'd with Mr. Fosbrook the Commissary the first time that he dind with any of the Officers of the Colony.
Tuesday C.S. Massey	2	am at home all the day
Wednesday C.S. Duncannon	3	am at ½ past 10 I went to the Farm with the Governor to inflict punishment upon some men, and returnd to dinner. Martha Hays was brought to bed of a Girl this eve at ½ past 11
Thursday C.S. Valentia	4	am at 10 I sent Th's Salmon to the Farm dismissd him from my service and took Tho Stokes as a Servt

Friday 5 am at 11 I walkd to the Farm to see Marth Hays and
C.S. returnd home to dinner.
Kinsale

Saturday 6 am People employd in clearing my Ground
C.S.
Cape Clear

Sunday 7 am at 11 Performd Divine Service. the Lt. Gov., &c &c.
C.S. attended. in the aft Mr. & Mrs. G. call upon me and
Kilmore took Tea

Remarks Hobert Town, River Derwent, V.D.L. A'sia.

Monday 8 am at 11 I walkd to the Farm and everything at a stand
C.S. for want of rain. The grass parchd up and all our Gardens
Donegall

Tuesday 9 am at home all day seeing to my Ground being cleard
C.S. At 1 pm the Country from the Gov. Farm to Sandy Bay
Sky all on fire by the Natives.

Wednesday 10 am at 11 I walkd to the Farm
C.S.
Pentland

Thursday 11 am at 11 I waited on the Governor who ordered me some
Bricks
Elgin

Friday 12 am this day being Good Friday it was keept Holy at 11 all
C.S. the Military Setlers Male and Feamale Convicts attended
Murray Divine Service. The day was remarkably fine.

Saturday 13 am at home all the morn upon Business. This Morn I
C.S. married Mr. Clark the Head Masoner to Mary Ginnins
Fort George free people. At 2 pm I took my boat and went a Fishing
and had very great success.

Remarks Hobert Town V.D.L. April 1805

Sunday 14 am Easter Day at 11 His Honor the Lt. Governor &c. &c
C.S. attended Divine Service, the day very fine.
Gee

Monday 15 am At 10 Mr. Groves and self went across the River to
C.S. get some Rails and we left 2 Men Tho Salmon and his
Blair Man to cut Rafters &c for his house.
We returnd home in the Eve

Tuesday 16 am this morn My man returnd with 3 large Forest
C.S. Kangarros
Tay pm at 5 Native fires for a great distance on the oposite
shore.

Wed. C.S. Dunbarton	17	am at 9 Mr. Groves and self went to his men who were cutting wood for his House and from thence we walkd to Risdon. 4 pm the wind so strong against us that we were obliged to run* to the Farm and leave the Boat there walk home.
Thursday C.S. Dundee	18	am at home all day busy about my Garden
Friday C.S. Glasco	19	am at 11 I went across the water for some rails and returnd to dinner
Saturday C.S. Hamilton	20	am at 11 Mr. Groves and self went to the other side of the river for his men who were cutting Trees for him and My Man brought there the largest kangarros that has been killd. Neither Salmon nor Gains could [ ](1) it without dividing same.

Remarks Hobert Town V.D.L. Asia

Sunday C.S. Dalkeith	21	am at 11 I went to New Town and performd Divine Service
Monday C.S. Douglass	22	am at home all the Day
Tuesday C.S. St. George	23	am at 8 this morn the colours were hoisted it being St. Georges Day. at 11 I went in my boat to Herdsmans Cove and took my Kangarro Dogs with me in the eve I went out and killd one Kangarro the only one I saw slept in a Tent there Mr. Hays was with me. In the Eve I was lost for some time owing to the Distance the Kangarro took me.
Wednesday C.S. Dumfries	24	am Early this Morn My Man killd 3 Kangarros—I went out afishing and caught some very large rock codd I slept there again
Thursday C.S. Wigton	25	am this morn my Man killd an Emew and unfortunately lost my Dogs. At 1 pm Mr. Hays and self &c but my Man got into the boat and left the Cove for Hobert Town At ½ half past 5 I got home to dinner. In the eve I went to speak to Mr. Groves and on my return the Gov calld me to him where I stayd sometime I sent the Lt Govnr the young Emew this day 2 years we saild from Spit Head the Ocean Transport in company with us. Capt Mertho owners the Hurrys

Remarks Hobert Town V.D.L. 1805 April

* ? row.

(1) Illegible (probably 'bring').

Friday 26 am at home all the day.
C.S.
Supply
General Orders Government House Hobert Town April 26. 1805
The Commissary will on Tuesday next issue until further orders the following Rations weekly. 3½ lbs Beef. 6 lbs Flour—6 lbs of wheat. 6 oz. of Sugar.

Saturday 27 am at 11 Mr. Groves and self went up the river and caught some very fine Rock Codd My Man returnd with my Dogs and brought a very fine Emew and Kangarro
C.S.
Carlisle

Sunday 28 am at 11 performd Divine Service attended by His Honor Lt. Gov. Collins &c &c.—Mr. & Mrs. Groves Drank Tea with me.
C.S.
Solway

Monday 29 am at ½ pas 11 I met the Lt Gov and Mrs. Powers, she told me that they were coming to my house to speak to me, Gov said that he could not make it conveniant to go to the Farm and have Martha Hayes Children Xtiand. I asked Him if he did not mean to stand for the child. his answer was, no, but requested that I would go there. I walkd and of course found them unprepared with Godfather and G.Mothers as the Lt Gov had promised to stand for the child and Mrs. Powers.
C.S.
Kilmore
Mr. Groves calld upon me in the eve.

Remarks Hobert Town V.D.L. May

Tuesday 30 am at 11 Martha Hays and Mother calld upon me. At 1 pm Mr. Groves and self went up the River and pitchd the tent beyond Risden
C.S.
Bute

May 1 am at 7 we breakfasted and walkd to the Coal River near Frederic Henry Bay. the distance was 12 miles across a very bad country very bad walking. we see many Kangarros and Emews Owing to the tide coming up we could not see any coals &c &c.
Wed. C.S.
Clyde

Thursday 2 am at 8 this morn we got into my Boat and went to Herdsman' Cove Many of the Natives were all around and the Country in fire. in the eve we had a great deal of rain
C.S.
J

Friday 3 am much rain which continued till 12 at 11 we got into the Boat and at ½ past 3 pm arrived at Hobert Town.
C.S.
Aberdeen

Saturday 4 am fine mild Wr with gentle showers of Rain, at 11 I discoved a very daring Robbery which John Earl My Gardner had committed upon me by breaking into my Closet. I found Brandy and some Pick lock Keys upon him.
C.S.
Kenyard

1805 Remarks Hobert Town V.D.L. May 1805

Sunday 5 am the Weather so damp that divine Service could not be performd.
C.S.
Hay

Monday 6 am engaged this morn in committing John Earl for robbery. he broke into my house and stole some Spirits and for which he was ordered by the magistrate—
I sat up the Bench to try 4 Prisoners who robbd the Stores of Flower
500 Lashes

Tuesday 7 am this Morn my Man that Robbd me receivd part of his punishment of the 500 lashes—, at 1 pm I walkd to the farm home at 5 to dinner. I heard a Whale in the River this Eve.
C.S.
Bruce

Wednesday 8 am at 11 a party of the Prisoners that were going away with a new Whale Boat were detected and confind, I went out afishing afterwards and had very good success. Mr. Harris and Janson went down the River to Frederic Henry Bay to survey a piece of water there calld Pitt Water.
C.S.
Detect

This day I see a large Whale in the river opposite the Hobert Town

Thursday 9 am at 11 His Honor the Lt Governor Revd. R. K . . . d and Wm. Sladden Esqr, set to examine Samuel Gun alias Camel Chris. Forsha—alias Watkins—John Williams alias Johnson—Munden—Hayward Horne Prestige Avery. Prisoners that were going to take the new Whale boat and make their escape in it to New Zealand. Although the information was so true that we receivd yet could not get anything from them to convict them Rain all day and in the Eve.
C.S.
Harris

Parole Pitt Water

Remarks Hobert Town Van D.L. May 1805

Friday 10 am dark cloudy Wr. I went out afishing very little success
C.S.
Fife

Saturday 11 am at 11 I went down the river in my boat aFishing Caught a Parrot fish Rock Cod and others returnd home at 5 pm Ponto was lost
C.S.
Dunbar

Sunday 12 am the weather so Damp that Divine Service could not be performd. at 5 pm Mr. Harris returnd from Pitt Water
C.S.
Wallace

Monday 13 am at 11 a strong Breeze and at 4 pm it blew very hard which continued all night at 11 pm a perfect gale of wind.
C.S.
Darnley

Tuesday 14 am at 9 moderate and fair wr. at 11 I went aFishing
Douglas very little success this day I had a very fine peice of Roast Pork for dinner sent me by order of His Honor Lt Gov Collins

Wednesd 15 am at 11 I went across the River to put my man after
C.S. Kangarros. Caught some very fine FlatHeads
Howard

Thursday 16 am at 7 it—began to rain which continued all day at ½
C.S. past 1. pm I went afishing and had very good success
Erskine Returnd to dinner at 6 pm Continual rain.

Remarks Hobart Town V.D.L. May 1805

Friday 17 am at home all the day. pm the wr. very fine this day
C.S. some of the prisoners began to Exercise the Great Guns—
Crawford in readiness for the 4th of June.

Saturday 18 am at 12 I went afishing and caught 38 Rock Cod, some
C.S. very large and 5 Perch and some Flat heads in all about
Percy 60 Fish and returnd home at 5 pm to dinner.

Sunday 19 am the Winter being now and the ground being so damp
C.S. that Divine Service could not be performd pm the after-
Lenox noon very fine

Monday 20 am at 11 engaged upon the Bench afterwards at home
C.S. all the day
Maitland

Tuesday 21 am at 10 the Weather remarkably fine Vanstrutton
C.S. employd erecting my Kitchen Chimney and Oven and
Forbes Stove at 11 I went out afishing and caught a very large Crayfish, the first that was taken in this Colony which I gave to His Honor the Lt. Gov. on my return home to dinner late in the eve rain and wind.

Wed 22 am much wind this morn at 11 went out a Kangarroing
C.S. home at 4 to dinner
Mackenzee

Thursday 23 am at 11 I went out afishing on the east side of the River
C.S. at 12 it began to blow very fresh I continued there till
Maxwell ½ past 3 pm the wind increasd but I venterd over with one man and self Gains my keeper, the Black Cutter that went with Capt Flinders safe so many leagues at sea was obliged to put back at 7 much lightning and a hard gale. 8 heavy rain, 11 blowing very hard from the S.W. 12 down

Remarks Hobert Town V.D.L. May 1805

Friday 24 am all the officers receivd 10 gallons of Spirits this Morn
C.S. Mr. Harris and self sat upon the Bench at 1 pm I walkd
Cullen to the Farm and home to Dinner.

Saturday 25 am this Morn Rain at 11 I sent my men Gains and Jones
C.S. in my boat up the River after Kangarros ½ past 12 Capt.
The Plough Sladden and self sat upon some business respecting Mr. Harris Man Kerhoe

Sunday 26 am at 10 fine weather but cold divine Service could not
C.S. be performd My Man returnd with three very large
Mar Kangarros

Monday 27 am at home all day a great many Whales in the River
C.S. non bene
Nevil

Tuesday 28 am at home all the day. Non bene
C.S.
Boyd

Wednesd 29 am at home 2 pm I went out afishing and caught some very
C.S. fine Pirch. Rock Cod and a Crayfish, Returnd late to
Castle dinner.

Thursday 30 am at home all the Day
C.S.
Rochester

Friday am at 12 I went in my boat afishing and caught a Crayfish
C.S. weight 6 lbs. came home to dinner
Brompton

Remarks Hobert Town V.D.L. June—1805

Saturday 1 am at 11 I went in my boat to Risdon and walkd home
C.S. from the farm to dinner got some Quails—sent my man
How a Kangarroing and Jones, I came home to dinner.

Sunday 2 am moderate wr but cold and very damp At 4 pm my
C.S. man returnd from Risdon and brought home three large
Victory Kangarros 1 of 120 lbs, 1.80—1.70—in the eve I went and supd at Mr. Groves I carried them a Crayfish which I caught weight 7 lbs this day aged 43. years.

Monday 3 am at home all day this morn I Christian Mr. Bowden's
C.S. child
Rejoice

Tuesday 4 am It being His Majesty's Birth day, was a Holiday
C.S. throughout the Colony at ½ past 11 the Military Paraded
The King and at 12 a Royal Salute 21 Guns were fird. At 2 pm His Honor the Lt. Gov. gave all the Prisoners ½ a Pint of

Spirits 5 pm His Honor gave a dinner to all the Officers Civil and Military and the Eve concluded with a large Fire and other demonstrations of Joy Cap. S . . . has a Government mare[1] which he uses to harrow his ground.

Remarks Hobert Town June 1805 V.D.L. Asia

Wednesday 5 am at 11 Mr. Groves and self went to Risdon in my boat
C.S. and there we dind and stayd all night.

Thursday 6 am at 12 we left Risdon and came to Hobert Town
C.S.
Durham

Friday 7 am at 11 Engaged all the morn upon Business and Mr.
C.S. Harris with me My man returnd from Risdon.
Tyne

Saturday 8 am the wr fine at 2 pm I went across the River and
C.S. caught 4 very fine Crayfish. In the Eve sent His Honor
Trent the Lt Govnr one

Sunday 9 am at 9 I was informd that there was a Ship in Sight
C.S. at 4 pm a Boat Returnd and informd us that it was a
Hope Whaler the Richd and Mary.

Monday 10 am this morn the whaler came opposite the Town, the
C.S. whaler Richard and Mary out 18 months from London.
Arrival Captain Lucas owners of the same name she came last
from Sydney and engaged in the house with Mr. Cambel
Lucas and Spencer and Wm Collins—late of Hobert Town
& Co [ ][2]

Remarks Hobert Town June 1805—V.D.L. Asia

Tuesday 11 am this day I began to sow some wheat. At home all the
C.S. day
Camden

Wednesday 12 am at 10 Mr. Groves and self went in my boat on board
C.S. the Richd and Mary Whaler, to buy some sheep—but could
Melville not they were too dear—in the eve returnd to dinner

Thursday 13 am at home all the day busy in sowing wheat
C.S.
Strachen

Friday 14 am engaged all the morn upon the Bench at 5 pm a boat
C.S. came up the River from the Good intent Schooner, Mr.
Smith Kelly, Commander from Kings island

(1) 'mare' (query 'man').
(2) Illegible (probably 'London').

Saturday 15 am Early this morn the 5 prisoners that went away on
C.S. the 25th of March at 2 pm George Collins the Lt. Gov.
Humber Son and self went across the River in the Eve he dind with me. I sent the Lt Gov. a Crayfish

Sunday 16 am the weather cold not able to have Divine Service per-
C.S. formd at home all the day
Recovery

Remarks Hobert Town V.D.L. asia.

Monday 17 am at home all day
C.S.
Eden

Tuesday 18 am engaged all the Morn upon business examining the
C.S. 5 Prisoners that went into the Bush They informd me
Dacres that on the 2 of May when they were in the wood they see a large Tyger that the Dog they had with them went nearly up to it and when the Tyger see the men which were about 100 yards from it, it went away. I make no doubt but here are many wild animals which we have not yet seen

Wednesday 19 am this morn my Man came back from Kangarro Hunting
C.S. and had very great success Killd 3 large Kangarros and
Scott 2 very large Emews My little sow had young Piggs.
at 4 pm the Governor Hunter Schooner from King Island
12 Piggs anchord in the Bay.

Thursday 20 am at home all the morn 3 pm it began to rain ½ pas
C.S. Mr. and Mrs. Groves and son dind with me the eve very
Oyster Bay wet

June 1805 Remarks Hobert Town V.D.L. Asia

Friday 21 am Continual Rain all this morn pm Do Wr and very
C.S. cold. Wind South 8 pm
Africa

Saturday 22 am at 9 do. wr. The Table Mountain was coverd with
C.S. snow. At 11 sent my Man to Herdsmans Cove with my
Dickson Dogs.

Sunday 23 am the Morn very cold and wet. At 7 pm My Man returnd
C.S. in my Boat from Herdsmans Cove with 2 very large Emews
Bronte and 3 large Kangarros.

Monday 24 am at 8 I was informd that six men had deserted from the
C.S. Camp. Steward, Carmical, Wright, Morris, Fernander and
Montross Camel and had taken my boat with them and the Government Oars—Camel & Fernander took my boat away to the Point where they had planted something

Tuesday 25 am at home all the day. busey upon Wades Business
C.S. pm I see Henry Hakin upon the Business of Stewarts &c
Elden going away.

Wed. 26 am saild this morn the Schooner and a party of Marines
C.S. with Hakin in it the morn wet. pm do. wr.
Cole

Thursday 27 am at 11 I walkd to the farm Mr. Hamilton returnd and
C.S. dind with me
Clarence

Friday 28 am at ½ past 11 I walkd with my Gun towards Sandy Bay
C.S. killd four very fine Lorket Birds and 3 Pigeons returnd
Bate to dinner at 5 pm

Remarks Hobert Town V.D.L. 1805

Saturday 29 am my people employd in breaking up Ground and fencing
C.S. in my Land. Sent my Man out with my Dogs on the
Hood East side of the River pm at 1 I took a walk to Sandy
Bay and took my gun Killd some Ground Pigeons very
much like the Pigeons in the West Indies

Sunday 30 am the Morn fine but very damp after the quantity of
C.S. Rain My Man returd home with 1 Emew a large
Winne Kangarro

Monday 1 am the Whale Boats brought a Whale which they had
July killd in Storm Bay
C.S.
Darnley

Tuesday 2 am at 11 I went on board the Richard and Mary Whaler
C.S. Capt. Lucas they had finishd cutting the Whale It was
Scorpion very large. 5 pm at 5 the Gov's son dind with me The
time twelve months the River was full of Whale.

Wed. 3 am at home all the Day at 6 pm I walkd down to Mr.
C.S. Groves, and the Lt. Gov. came and set there till 9.
Mitford

Thursday 4 am at 9 George Collins the Lt. Gov Son Breakfasted with
C.S. me and we walkd to Sandy Bay, at home all the aft this
Redesdale morn 2 loads of tiles came for my House.

Friday 5 am the morn very beautiful At home all day
C.S.
Graves

Saturday 6 am at 10 My Man returnd from kangarooing. He killd
C.S. 4 he gave 1 to Capt. Lucas ship Richd and Mary
Bedford pm the Day very cold I walkd to the Farm, many of the
Prisoners applyd for Kangeroo the Pork being so very
bad and only 2 lb 10 oz a week. A very severe frost this
morn the Ground coverd with frost.

July 1805 Remarks Hobert Town V.D.L. Asia

Sunday 7 am a very severe frost again pm at home all the day in
C.S. the eve Mr. G . . . s calld upon me.
Somerville

Monday 8 am very cold this morn pm at 3 a little rain 4 we heard
C.S. it Thunder at a distance
Windsor Castle

Tuesday 9 am at 11 I went to the Farm upon business and Mr. Harris
C.S. met me there. Lt Johnson Mr. Janson Surgeon was there
Mars Lt. Johnson sent three men out with his Dogs aKangarooing.

Wed. 10 am early this morn the wind was very high and at 9 the
C.S. mountain was coverd with snow. The day very cold at
Pawlett 7 pm blowing hard from the S.W.

Thursday 11 am early this morn blowing very hard with snow from
C.S. the S.W. at 8 do. wr. the day very cold pm do. wr. this
Pringle eve we had an Eclipse of the Moon.

Friday 12 am at 12 I waited upon His Honor and askd for Bowder
C.S. &c and he informed me that he knew nihil of Steward
Mermaid going away. vide.

Saturday 13 am engaged upon business all this morn at 4 pm Henry
C.S. Hakin and the 4 Soldiers return with the men that
Fishery deserted in my boat.

July Hobert Town Van Diemen Land

Sunday 14 am at 12 I took a walk to the Gov. Farm.
C.S.
Island

Monday 15 am at home all the morn till 12 when I went ashooting
C.S. after seeing Henry Akin
Archer

Tuesday 16 am this morn Mr. Harris and self were upon business all
C.S. the morn and we expected the prisoners Stewart &c that
Algiers went away with my boat to be brought before us pm
blowing very fresh from the NW at 4 pm we had infor-
Camel & Fernander mation that a ship was seen off Storm bay Passage ½ past
took my boat away Henry Hakin went with one of the Govmt. Boats down the
from the Moorings River. 7 a fire broke out at the House of Francis Cobb a
Prisoner which consumed the same in a short time It is
very remarkable that we have alway had a fire, when a
strange sail has been in sight, or very near the Derwent.

Wed. 17 am at 11 the Boat which took Henry Hakin to the Ship
C.S. Returnd and brought many letters from England. We
King George were informd that the Ship's name was the King George Whaler from Sydney belonging to Cable and Underwood olim prisoners at Sydney. I had letters from Salisbury &c

July Remarks Hobert Town V.D.L. Asia

Thursday 18 am at 10 Rain in the morning Early it blew very fresh
C.S. from the S.W. 12 the King George Whaler working up the
Argo River wind N.W. at 3 she anchord opposite my House.

Friday 19 am at 11 a large Whale opposite my House and Two Boats
C.S. from the King George Whaler after her. They killd the
George calf, but she went down immediately. They did not kill the Cow. at 2 pm I took a walk to Sandy Bay and see some Pigeons, it is remarkd that the Bronswing Pigeons have not left us this winter, which shows it is not so severe as last.

Saturday 20 am at 9 the Boats were after Whale in the River at home
C.S. all the day
Woodriff

Sunday 21 am at 10 the King George Whaler went down the River
C.S. from Sullovan Bay. the day very fine but cold. the
Legg mountain coverd with snow. at 8 pm we obserd some Native fires towards Risdon.

Monday 22 am 10 very cold at home all the morn
C.S.
Dundass

Tuesday 23 am at 7 we had a little Rain and very cold 2 pm a ship
C.S. appeard standing up the River. at 4 pm she arrivd and
Edgeware anchord in the bay the Sophia Capt Collins from Sidney

July 1805 Hobert Town Van Diemens Land Asia

Wed. 24 am at home all the day
C.S.
Sophia

Thursday 25 am this morn a sharp frost. The vessels that are a Whale
C.S. fishing here are the Richard and Mary Whaler, Capt Lucas
Argo of the house of Lucas and Co. London King George Whaler Capt. Moody owners Lord Cable and Underwood Sidney, Sophia ship Capt. Collins, owner Camel Sidney, the Recovery schooner Capt. Kelly belonging to the house of Camel

nr

Friday 26 am this morn I waited upon His Honor Lt. Gov. Collins
C.S. vide 4 pm Capt. Lucas of the Ship Richard and Mary
Fitzroy whaler and Mr. Groves & Son dind with me

Saturday 27 am at 11 His Honor the Lt. Gov. took Kangarro into the
C.S. store at 1 shilling per lb. After the selling this morn
Orde I walkd to the Farm.

Sunday 28 am at home all the day
C.S. a great many whales in the River beyond Hobert Town
Shipley

Monday 29 am this day I got some more wheat in and the Men
C.S. employed in chipping it in.
Moore

1805 Hobert Town Van Diemens Land July

Tuesday 30 am My Men employd in breaking up more Land I took
C.S. Mr. Clark's Boat out for the first time afishing in the Bay
Halloway

Wed. 31 am at 11 I walkd towards Sandy Bay to kill a few Wattle
C.S. Birds in coming home I see a Kangarro and set my Nettle
Hervey at it she drove it down towards me, I shot at it and killd.
4 pm calld on Capt. Lucas who informd me they had killd
many Whales at Frederic Henry Bay. at 10 pm his ship
anchord opposite the Town

Thursday 1 August 1 1805
C.S. am this morn at 7 it was a sharp Frost. at 1 pm I took
Paget a walk to the Government Farm

Friday 2 am at 11 I took a walk and met my man who came down
C.S. In Clark's Boat from Herdsman's Cove having killd 2
MacKenzie Kangarros and 2 Emews at 3 pm Mr. Lucas's Men caught
a large Whale near Hobart Town and while they were
towing it to the ship a Whale was aground opposite my
house upon the shore but got off again. Not a Glass of
Spirits in the Colony to be had.

Saturday 3 am this morn I calld upon Capt Lucas. Mr. Collins busy
C.S. in opening his shop.
Bombay

August 1805 Remarks Hobert Town V.D. Land

Sunday 4 am It raind all the day and much snow upon the mountain
C.S. at 4 pm
Majestic

Monday 5 am A very fine morn. Employd all the morn in planting
C.S. and sowing seeds after the rain The Mountain was
Aylmer coverd with snow.

Tuesday 6 am at 9 I went up the River in Mr. Clarks Boat opposite
C.S. Risdon and returnd to dinner at 5 pm non bene this day
North we were put on shorter allowance 2 lb 10 oz Pork 2 lbs
Flower 2 lbs wheat 2 lbs Meal & not a drop of spirits in
To R.M. seal 2 lbs the Colony
10, [ ](1) 6 lbs
wheat and 6 lbs
flower

Wednesday 7 am the day very cold at home all day employd about my
C.S. gardens
Warren

Thursday 8 am at 11 Rain this morn I sew some grain. At 2 pm the
C.S. wind was very high & it rained a little and it blew a gale
Diomede of wind from the S.W. which continued all night and rain
at intervals

Friday 9 am this morn early the wind was very high from the
C.S. S.W. which contined till 8. ½ past 8 My Man Gains and
Tooke Shaffart both came home from up the River they brought
6 large Kangarros and 2 Emews. I put into the stores
at Hunters Island 296 lbs of Kangarros, 1 they eat in the
bush and 1 they sent home on Wednesday last besides
2 Emews which the Dogs killd and they could not find.
My two Dogs Spot and Alexander killd them. At 7 pm
blowing hard

August 1805 Remarks Hobert Town V.D.L.

Saturday 10 am the morn very windy. at 10 more moderate and fine.
C.S. Mr.
Mudge

Sunday 11 am the Morn very fine but the mountain coverd with snow.
C.S. pm do. wr. at 4 we heard whales very near the town.
Morrison

Monday 12 am I Honor of His Royal Hiness the Prince of Wales
C.S. Birth the Colours were hoisted on Hunters Island. At 12
The Prince the Royal Marines fird three Vollies the day remarkably
fine

Tuesday 13 am the morn very fine at 2 pm His Honor the Lt. Govnr.
C.S. calld upon me at my cottage which he much admired. This
Conway day at 12 I sent my Menn with my Dogs a Kangerroing
at 4 pm it began to rain which continued all the Eve.

Wed. 14 am Continual rain all the day and likewise the Eve
C.S.
Oliver

(1) Probably oz. (in bracket).

Thursday 15 am the Morn very damp and cold and Rain at intervalls
C.S.
Urania

Friday 16 am at 8 my men returnd from akangarroing from Herdsmans Cove they brought home 8 Kangarros and an Emew. 4 I put into His Majesty's Stores and an Emew. They weighd 342 lbs—1 Kan 96 1.92 4 I keept at home 2 of which I gave away to people that had none the colours were hoised this morn in Honor of the Duke of York's birth.
C.S.
Duke of York

at 8 some lightning from the N. West at 10 it began to blow which continued till 12

August 1805 Remarks Hobert Town V.D. Land

Saturday 17 am at 2 it raind and blew very hard this morn the mountain was coverd with snow. I was informd this morn that the marines had the full allowance of wheat and flower 6 lbs of each and pork instead of Kangarro. At 10 rain and blowing very fresh at 2 pm the wind increasd which continued blowing hard all night.
C.S.
Storm

Sunday 18 am early this morn do. wr. blowing very hard this day was the severest that we had since we have been upon the Colony the wind was a contual Gale from the N.W. It blew down many trees and unroofd Houses and took down many poles from different people
C.S.
Cambel

Monday 19 am the Gale continued all this morn blowing from the S.W. at 4 pm it rather abated At 9 much lightning and at 10 it raind very hard which continued some time.
C.S.
Leith

Tuesday 20 am rain this morn at 1 pm I walkd to the farm and Xtiand Martha Hays two Daughters the Lt Govnr stood for one, at 2 it snow very hard, the road to the farm was very wet. I returnd home to dinner This morn my men went out with my Dogs.
C.S.
Snow

Wed. 21 am this morn I walkd to the farm and Xtiand Mr. Hay's son the day very fine after the wet and Gale from the S.W. the weather is very cold.
C.S.
Return

[Here one page, containing entries for 22nd to 30th August, has been cut from the Diary]

Sept. Hobert Town Van Diemens Land

Saturday 31 am continuel rain I walkd to the farm at 1 pm many whales Wind S.E. the Mountain coverd with snow
C.S.
Orpheus

Sunday 1 am the weather very fine but exceedingly damp.
C.S.
Maitland

Monday 2 am Early this morn my Man Gains returnd with my Dog
C.S. which was lost. I went out ashooting and killd some
Preston Quails the day very fine.

Tuesday 3 am employd all the morn upon business at 1 pm Gains
C.S. and self walkd with the Dogs towards Sandy Bay and
Supply killd a very large Forest Kangarro

Wed. 4 am at 10 I went up the River near Risdon and see the
C.S. Richd and Mary coming up the River from Frederic Henry
Minerva bay, I landed by Prince of Whales Bay and walkd Home.
At 3 pm see Capt Lucas's boats from the Richd and Mary
after Whales. They killd three opposite Hobart Town
this day.

September 1805 Remarks Hobert Town V.D. Land

Thursday 5 am at home all the Morn the People finisd Tiling my
C.S. House. busy Thatching my kitchin this aft at 3 we had
Darby some rain. the mountain with snow.

Friday 6 am the day very fine at 2 pm I walkd to Sandy Bay Capt
C.S. Lucas ship went down to Storm Bay Passage I killd a
Castor couple of Teal

Saturday 7 am the day very fine 2 pm I walkd to the Farm after the
C.S. Morning business
Peterchment

Sunday 8 am the Morn very fine At 6 pm the King George Whaler
C.S. Capt. Moody came up, and anchord in the Bay
Rolle

Monday 9 am at 7 My Men returnd from Herdsmans Cove brought
C.S. home eleven Kangarros. They kill 15 in all My Bitch
Trigge Miss killd two the first time she ever went out My man
killd Black Swan Mr. Groves and Son dind with me.
Sent a Bill & Certificate to England. Sent 316 lb of Kangarro in to His Majesty's Store

September Remarks Hobert Town V.D. Land 1805

Tuesday 10 am at 9 I walkd with my Man Gains to a River calld Mr.
C.S. Brown's, down towards Storm Bay Passage distant from
Ocean Hobart Town 10 or 12 miles across the country where it
was very bad walking at 4 pm I returnd and Mr.
Capt. Bristo Hambleton dind with me, he went on board the King
George Whaler, Capt Moody. On my return I was informd
Papers to the beginning of April that the Ocean Whaler Four months since from England
was in adventure bay where she had been twenty eight
days and had taken 60 tonns of oil,
Not a glass of spirits in the Colony

Wednesday 11 am at home all the day. At 11 am saild Capt. Moody of
C.S. the King George Whaler for Sidney. I planted a few
Enderby little Indian Corn. the day very fine.

Thursday 12 am this morn saild the Richd and Mary to adventure Bay.
C.S. My Men went out with my Dogs.
Cornwallis

Friday 13 am this day we had some very fine showers I walkd to
C.S. the farm
Castlereagh

Saturday 14 am busy this morn at the Court
C.S.
Sidmouth

Sunday 15 am the morn very fine at 5 pm my Men returnd from
C.S. Hunting and brought home a white Kangarro
Lake

Mond. 16 am at home all the morn. pm the day fine This
C.S. day saild the Ocean Whaler Capt. Bristo from Adventure
Louis Bay where she had got 70 tun of Black Whale Oil in a
The Ocean Whaler month to Norfolk Island and from thence was to go to
was only 20 days New Zealand for Spermacity oil.
in Adventure Bay and caught 60 tun of oil. When the season ends here the
Fishery begins at New Zealand.

Tuesday 17 am at 2 it blew a Gale of wind Capt Lucas ship the
C.S. Richd and Mary was obliged to weigh anchor and come up
Essington the River, She brought four whales up to the Try Potts
blowing hard all the Day from the South East with rain,
and at 4 Hard Gale with Hail and Snow. The Evening
wet.

Wed. 18 am the morn wet at 10 I went up the River in the boat
C.S. opposite Risdon and landed. walkd to Mr. Millers Farm
Drury where I see 37 Black Swans in the River calld at Martha
Hay's on my way home.

Thursday 19 am at 12 Martha Hays and her mother calld at my house
C.S. from the Governor. pm the aft at 4 very cold. Wind S.E.
Palmer preparing my ground for Pot 8 os. I heard that the Spirits
which some of the officers bought of Capt Bristo at 25sh
per Gallon was very bad rum from the Leward Islands

Sept. 1805 Hobert Town Van Diemens Land

Friday 20 am I waited upon the Lt. Gov, and he offerd me 10 Gallons
C.S. of spirits which I receivd
Bowwater

Sat, C.S. Darby	21	am at 11 engaged all the morn with Capt. Sladden and Mr. Harris. at 4 pm the King George whaler Capt. Moody came to the East side of the Bay from adventure Bay where he had been whaling, to land his oil with Mr. Collins.
Sunday C.S. Coronation	22	am the morn fine at 4 pm it began to Rain but was fine in the Eve, At 8 Rain which continued all night
Monday C.S. Stirling	23	am Rain all this morn 3 pm the wr. was bad this Eve my men came home from hunting and brought 9 Kangarros
Tuesday C.S. Markham	24	am the morn fine at 1 pm I went up the River in the Boat to Risdon to enquire after 2 Dogs which My men had lost. Not there came home late to dinner
Wed. C.S. Troubridge	25	am employd in planting pot 8s seed from Millers, He came and took away my little Sow and Pig. Two Bushells which gave the enormous price of £3 10s per Bushell 2 Bushells
September 1805		Hobert Town Van Diemens Land
Thursday C.S. Cochraine	26	am early this morn Thoms Steward and Morris took away one of Mr. Harris Dogs and Sarjt. Thorns and absconded from Hobert Town
Friday C.S. Murray	27	am at 9 I went across the River to see the Tryworks they had a great Quantity of Oil in casks. Mr. Collins bought a 100 ton of oil from Capt Moody of the King George Whaler which she had caught since she had been in the River
Saturday C.S. Sutton	28	am at home all the morn 5 pm Capt. Lucas dind with me
Sunday C.S. Wertenburg	29	am at 9 got all my rye chippd in by Wm Jones &c &c at 11 saild the King George Whaler belonging to Messrs. Cabel and Underwood to Sidney Steward and Morris that deserted from Hobart Town returnd.
Monday C.S. Sidney	30	am the morn wet. engaged some people to clear me 4 acres of land near the House in addition. pm at home planting Pot 8 0s &
October 1805 Hobert Town Van Diemens Land		
Tuesday C.S. Manley	1	am I took a walk to the farm and killd 2 Bronswing Pigeons

Wed. 2 At 11 I went after more pigeons but could not find any
C.S. Capt Lucas supplied the Colony with a small quantity of
Spencer Provisions had he not the allowence would have been
2 lbs of bread a week and 4 lbs of Kangarro at 11

Thursday 3 am at 11 two strange Boats were seen, coming up the
C.S. River. 12 they arrived at Hobert Town the men came
Wolesly from Schooting Island as they had no provision left and
4 came in my boat to my great joy. 2 pm I went to the
Guard House when the boats lay and the Governor came
to me, he gave me joy of the return of my boat and
ordered to be repaired in the best manner immediately.
In the Eve Mrs and Mr Groves drank tea with the Govnr.
who express his gladness of the return of my boat.
This morn I gave the Governr the skin of a very beautiful
white Kangarro a very great rarity, the first that has
been seen in the Colony.
In the eve I smokd my pipe at Mr. G. and stayd late

Oct. 1805 Hobert Town Van Diemen Land

Friday 4 am the day very fine the morn I sew some Canary seed
C.S. &c &c at 4 pm the Sophia came and anchord opposite my
Dorset House She came from Frederic Henry Bay with oil up.
½ past 4 my men came from Herdsmans Cove with my
Dogs.

October 1805 Hobert Town Van Diemens Land

Saturday 5 am at 7 saild the Richard and Mary Whaler Capt. Lucas
C.S. to Sidney. They gave three cheers as they went away.
Success at 12 the Lt Govnr took in no more Kangarros in to His
Maj stores having a small supply from the Rd. and Mary
the quantity that I turnd in with my dogs since the 3rd
August follows at one shilling per lb.

1805	3	70	— —	3. 10	stores after being skind and well cleand weighd
August	8	296	— —	14. 16	105 lbs. My Dogs have killd the largest and
	16	342		17. 2	have had only two men out with them when
	23	268		13. 8	others of the officers have had three and four
	27 29	42		2. 2	men out at a time with theirs besides a Govern
Sept	9	316		15. 16	ment boat at command which I have not once
	16	224		11. 4	had
	24	350		17. 10	
	24. 27	85		4. 5	
Oct.	5	160		8. 0	
				£107. 13	

The number of Kangarros killd by my Dogs in two months and 2 days were 66 and the quantity given away and used in the House did not amount to less than £160. This day I sent one to the

October 1805 Hobert Town Van Diemens Land

Sunday 6 am it began to Rain at 7 and continued all the day very great quantity fell at home all the day
C.S.
Irwin

Monday 7 am the day very wet and damp. Employd in planting various things.
C.S.
Purvis

Tuesday 8 am at 8 I went to the farm with an intention to have gon to Risdon, but the weather blowing so hard we could not get up the River.
C.S.
Kings Island

Wed. 9 am at home all the day employd sowing seeds
C.S.
Faulkner

Thursday 10 am at home all day writing &c for Sidney. I made a new Melon bed the wind very fresh from the S.W.
C.S.
Edwards

Friday 11 am settled my account with Messrs, Cambel & Co.
C.S.
Procter

Sat. 12 am continual rain all the morn pm do. wr. at 10 the Night watch fird at a man at Manbys Stock Yard.
C.S.
Ferguson

October 1805 Hobert Town Van Diemens Land

Sunday 13 am at 9 the Wr fine but damp after incessant rain, the Sophia—Collins preparing to sail. 10 the Hill clear of clouds, but Snow upon it.
C.S.
Montagu

Monday 14 am at 8 the Schooner Recovery which had been awhaling here sometime saild for Sidney my men went to the Coal River I took a walk with my gun and killd a Kangarro
C.S.
Bowen

Tuesday 15 am at 10 I walkd out with my Gun but could not kill a Kangarro. 3 pm my Men returnd from the Coal River and my Young Bitch Miss killd 2 very large Kangarros. Gains brought home some coal from the River and very good.
C.S.
Bickerton

Wed. 16 am at 8 the Sophia Mr. W. Collins made the Signal for sailing—11 George Collins the Lt Govnr Son calld upon me to take his leave 1 pm I see Mary Collins the Lt Govnr Daughter and wishd her Health &c. 5 pm the Lt Govnr. went on board the Sophia with his Son and Daughter and left them there
C.S.
Sullivan Cove

October 1805 Remarks Hobert Town Van Diemens Land

Thursday 17 am at 8 the Sophia Mr. Collins saild for Sydney at 2 pm the Breeze setting in she anchord opposite Ralphs Bay
C.S.
Sophia

Friday 18 am at 11 I went afishing and had very good success the
C.S. Sophia saild this morn from Ralphs Bay.
Rowley

Sat 19 am at home all the Morn till 11 then went out afishing a
C.S. strong Sea Breeze.
Savage

Sunday 20 The Morn very cold Do Sea Breeze
C.S.
Aplin

Monday 21 am at 8 I went out with my Gun and shot a Kangarro
C.S. returnd about ½ past 1 pm Nocte Do Sea Breeze
Douglas

Tuesday 22 am Early this morn my men went out a Kangarroing
C.S. towards Sandy Bay but could not find any Busey after
West my Garden all day
The Sea-breeze generally sets in soon after 1 pm

October 1805 Hobert Town Van Diemens Land

Wednesday 23 am Early this morn Gayns and Shaffart went out in my
C.S. boat across the River. at 5 pm infermation was given
Berkley of a sail being in sight. Boats went down the River immediately at 6 the Governor Hunter Schooner anchord in the Bay and by her arrivd 582 Bushells of wheat and Pork to the very great comfort for the Colony the Prisoners having been five weeks upon 2 lbs 10 oz of Pork and 4 lbs of Bread the whole allowance of which might be eat up in one day and a Half. I may truly say the Colony was in a very dreadful distress and visible in every countenance. had it not have been for the good success in killing Kangarros the Colony would have been destitute of Everything. We had only three weeks flower in the Colony and 5 weeks Pork
The Governor Hunter Schooner, was the one that Steward and the party that took my boat away went to take.
A strong Sea breeze

1805 Oct. Hobert Town Van Diemens Land

Thursday 24 am This morn the Government Boats engaged in emptying
C.S. the Govnr. Hunter Schooner My Men returnd from the
Governor King Coal River with 2 large Kangarros
Sea Breeze,

Friday 25 am at 10 the wind was very high from the S.E. and E.
C.S. and very cold. pm do. Wr. at 7 rain which continued all
British Isles night The Colours this Morn were hoisted on Hunters Isle in Honor of the day. Do Sea breeze

Saturday C.S. Hanover	26	am A great Quantity of Rain fell at 9 raining hard. at 12 there was the greatest fall of water in my Garden and at Sproulls [ ][1] we came to the Derwent. at 4 pm Mr. Chace and Groves dind with me. Do. sea breeze
Sunday C.S. Dacres	27	am the Morn very fine after the great fall of Rain at home all the day. this morn my Men went out after Kangarros and returnd at 5 pm with three Do sea breeze
Monday C.S. Calder	28	am at 11 Mrs. Powers and Groves came to see my cottage. 1 I gave them a Kangarro Stake &c. finishd the last of my Port Wine. Martha Hays and mother calld upon me 5 pm I had 2 young feemale Goats Do Sea Breeze.
Tuesday C.S. Duckworth	29	am at 11 the Govnr. sent a man to me from the Farm afterwards I went out afishing had very bad luck the day very cold and a strong Sea Breeze.
Wed. C.S. England	30	This morn my Man went out with my dogs at 11 information was given that a Ship was in sight the Government boat went down 2 pm it returnd a false alarm 2 pm very Strong Sea breeze the ration at this time is 6 lbs wheat a week per man 2 lbs 10 oz of Pork you may see Distress in Every ones countenance. to my knowledge that 5 small fish the Price was askd 2.6d.
Thursday C.S. Kemp	31	am at 11 I went out afishing in my Boat and caught some very fine fish. 6 pm my Men returnd and kill 4 Kang and an Emew.
November 1805		Hobert Town Van Diemens Land.
Friday C.S. Whitshed	1	am at 11 I went out in my Boat afishing the morn very cold and a strong Sea Breeze which has been regular for some days.
Saturday C.S. Collingwood	2	am the day very cold but I went out in my boat afishing pm at 9 I heard the Governor Hunter Schooner shorten cable Do breeze
Sunday C.S. Deans	3	am Early my Men went out in my Boat akang. the first time since she returnd. at 11 I walkd to the Government Farm to call upon Hays. returnd to dinner This Morn saild the Govnr Hunter Schooner for Pt Jackson. A strong Sea Breeze.
Monday C.S. Pakenham	4	am at 9 we had a strong land Breeze and a warm wind which continued all the day. Employd in my Garden about Pumkin Bed.

(1) [ ] illegible.

Tuesday 5 am at 11 Mr. Harris and self sat upon the bench 1 pm I went to meet my Man towards the Govt Farm at 3 I met him and returning home in my boat I observd a ship coming up the River. ½ past 4 she anchord opposite my House. H.M. Ship Buffilo Capt. Houston at 5 he went on shore. the first ship of His Majesty's Navy that came to Hobart Town She came from Sydney and brought us a little Provision. Mr. Humphry came in the ship.
C.S.
Knowles

November 1805 Hobert Town Van Diemens Land

Wednesday 6 am at 11 I went in my Boat up the River afishing had very bad success. Capt. Houston and a party went to the Govmt Farm and to Risdon. Sir E. Brown Hays and a party of settlers from Norfolk Island came to see my land &c., which they all liked very much and said it was the only place worth seeing.
C.S.
Houston

Thursday 7 am at 8 I went on board H.M.S. Buffalo Capt. Houston to Breakfast we came on shore together and at 10 went on the Parade when the Lt. Govnr had everything explained to his satisfaction respecting the assertions of Mr. Collins
C.S.
Wilson

Friday 8 am at 8 Capt. Houston calld upon me and we went on Board to breakfast
C.S.
MacMillan

Saturday 9 am breakfasted on board.
C.S.
Gower

Sunday 10 At 8 Capt. Houston and Mr. MacMillan the Surgeon breakfasted with me at 10 went on Board Lt. Johnson came we stayd and took Tiffin there at 1 pm Mr. MacMillan and Mr. Sherrard and self walkd to the Farm
C.S.
MacKenzie

Monday 11 am at 8 H.M. Ship Buffalo made the signal for sailing 9 the wind came contrary and she compleating her watering Capt. Houston and Mr. MacMillan calld upon me. at home all day.
C.S.
Vauxhall

Tuesday 12 am this day H.M. ship Buffalo Capt. Houston compleated her watering at 5 pm Capt. Houston dind with me.
C.S.
Tippo Hee

Wed. 13 am at 8 I went on board H.M. Ship Buffalo and Breakfasted with Capt. Houston Lt. Johnson Mr. Bowden, Mr. Humphry breakfasted then we made it up At 9 H.M. Ship Buffalo got under weigh 12 being down the river as far as Storm Bay Passage Lt. Johnson and Mr. Bowden and self came back to Hobart Town.
C.S.
Buffalo

November 1805 Hobert Town Van Diemens Land

Thursday C.S. Putney	14	am at 12 Lt. Johnson and Mr. Janson calld upon me and took tiffin
Friday C.S. Thames	15	am at 11 Mr. Fosbrook and Bowden calld upon me 6 pm His Honor the Lt. Governor calld at 8 it began to lightning at 10 it was a severe tempest which continued all night with rain at intervals.
Saturday C.S. Cobham	16	am this morn the Majestrates sat and G. P. Harris Esq. calld on me the wind blowing very hard from the S.W. and cold
Sunday C.S. Guilford	17	am at 9 do. wr. at home all the day at 10 pm we had a Heavy rain
Monday C.S. Monsel	18	am at 11 I went up the River beyond the Govmt. Farm in my boat and walkd Home
Tuesday C.S. Liphol	19	am the day very windy from the S.E. continual rain all day

November 1805 Hobert Town Van Diemens Land

Wed. C.S. Sladden	20	am at 12 calld on Mr. Fosbrook the wind blowing hard.
Thursday C.S. Harris	21	am at home all day Employd at my Garden. My men returd from Herdsmans Cove.
Friday C.S. Horndean	22	am 12 calld on Mr. Harris afterwards on Capt. Sladden and met Lt Johnson Mr. Fosbrook and Bowden there we walkd into the Govmt. Garden. afterwards went out afishing.
Saturday C.S. Cosham	23	am this morn I calld upon Mr. Janson and afterwards walkd to the Farm
Sunday C.S. Portsmouth	24	am at 9 Lieut Johnson Breakfasted with me at home all day
Monday C.S. New Cross	25	am at 10 I went out afishing Capt. Sladden and Mr. Bowden calld on me
Tuesday Blackheath	26	am at 9 I sent my man up to the Cove 11 self and Capt. Sladden sat on the Bench.

Hobert Town Van Diemens Land

Wed. 27 am at 9 Capt. Sladden and Mr. Bowden Breakfasted with
C.S. me at 1 pm Mr. Bowden and self walkd to the Farm
Welling

Thursday 28 am 11 I walkd up the River. 12 a Signal was made that
C.S. a ship was in sight. 4 pm she anchord in the Bay, the
Dartford ship Sidney Capt. Forester from Norfolk Island, and by her returnd Lt. Lord

Friday 29 am at 10 I see Lt. Lord who was coming to my House
C.S. At 6 pm Mr. & Mrs. Groves drank tea with me
Forrest

Saturday 30 am at 11 I was introduced to Capt. Forrest at 2 pm I
C.S. went on board for a little time my men returnd from
Patterson Herdsmans Cove

December Hobert Town Van Diemens Land 1805

Sunday 1 am at home all the day
C.S.
North Fleet

Monday 2 am at 1 the wind blowd very hard 2 we had a very
C.S. severe Gale which continued some time The Sydney drove
Gads Hill both her anchors. In the Eve the Governor called upon me

Tuesday 3 am at 9 Mr. Fosbrook gave a Breakfast to all the officers
C.S. and Capt. Forrest.
Rochester

Wed. 4 am at home all the morn Mr. Janson Bowden and Harris
C.S. calld upon me at 1 pm the ship Sydney went across the
Rainham River to the Try Works to take in oil

Thursday 5 am at home all the morn till 2 pm called upon Capt
C.S. Sladden
Boxchild

Friday 6 am at 11 I took my boat and went on Board the Sydney
C.S. Capt. Forrest
Preston

Saturday 7 am at 9 went on board Capt. Forrs ship and dind with him
C.S. blowing very hard all the day
Canterbury

Sunday 8 am at home all day
C.S. divine Service could not be performd
Ewell

Monday 9 am 11 Capt. Forrest came on shore and calld upon me
C.S. this morn I calld upon His Honor the Lt Govnr. the day
Dover very warm and land wind N.

Tuesday 10 am at 11 I went on board for a little while
C.S.
Knights Bridge

Wednesday 11 am 2 pm I went on board the Sydney to dinner came home
C.S. at 5.
Depart

Thursday 12 am 11 the Sydney came near Hobart Town and anchord
C.S.
Hammersmith

Friday 13 am at 11 His Honor went on board the Sydney at 1 pm
C.S. I went there. Lt. Johnson and a party of Marines went
Brentford on board with Smith a Marine to be tryd at Sydney

1805 Hobert Town Van Diemens Land

Saturday 14 am at home all day
C.S.
Spring Grove

Sunday 15 am ½ past 4 saild the Sydney to Frederic Henry bay to
C.S. take in oile at 11 performd Divine Service in the tile
Johnson house attended by His Honor &c &c.

Monday 16 am engaged at home all day
C.S.
Bedford

Tuesday 17 am engaged in writing letters for England at 11 pm His
C.S. Honor the Lt. Gov sent for me. I went to him and stayd
Egham till 2 am upon business.

Wednesday 18 am Lt. Johnson who went down in the Sydney came on
C.S. shore and informd us that Capt. Forrest was to sail on
Hartford Bridge Saturday morn and that he was to be on board on
Friday morn early

Thursday 19 am employd in my Garden sowed Turnips
C.S.
Whitechurch

December

Friday 20 am we sent letters on board the Sydney for England.
C.S.
Salisbury
Honble. Capt. Gardner Mrs. Pettit. Mr. Collins

Saturday 21 am early this morn Lt. Johnson went on board Deserted
C.S. from Hobart Town Carmical—Morris Scotsfort from the
Dorchester GuardHouse and Gibson, Mr. Hopley servt.

Sunday C.S. Bridport — 22 am at 11 performd Divine Service. St. MaCauley came from the ship, Mr. Powers brought a quantity of Spirits with him Lt. Lord drank tea with me and his friend

Monday C.S. Axminister — 23 am at home all the day a very strong sea breeze with heavy rain from the S. East.

Tuesday C.S. Honiton — 24 am very cold for the season and a quantity of rain from the S.E. with hail

Wed. C.S. Exeter — 25 am Xms Day morn at 8 the Colours were hoisted on Hunters Island at 11 all the Civil and Military attended Divine Service.

December 1805

Thursday C.S. Lancaster — 26 am at 3 I got up and Breakfasted 4 I got into my boat with my Men and went into Ralphs Bay and walkd to Frederic Henry where I had a Boat from the Sydney Capt. Forrest but it blowd so hard that I did not get on board till 9 pm had nothing to eat and drink since I left home. dind there Lt Johnson was on board. Mr. Bowden and Mr. Fosbrook came on shore with Boat.

Friday C.S. Forrest — 27 am staid on board all the morn 3 pm Capt. Forrest Lt. Johnson and self went on the South side of the Bay we see to me of the largest Ducks I ever beheld we return on board for the Eve.

Saturday C.S. Bodmin — 28 am at 5 I got into the Sydney's boat and came on shore got to Ralphs Bay and with a strong Breeze came to Hobart Town at 2 pm waited upon the Lt. Govr. who was very glad to see me shew me a letter from Mr. F. respecting Mr. Powers. I calld on Lt. Lord.

December 1805

Sunday C.S. Penryn — 29 am at 10 I walkd with His Honor the Lt. Govnr to Newtown where I performd divine Service at 4 pm I dind with him.

Monday C.S. Lands End — 30 At home all the day

Tuesday C.S. Kings Land — 31 am at 11 His Honor walkd to see Lt. Johnson Farm and Millers the settlers—engaged all the morn upon business

Hobert Town January 1806

Wed. C.S. New Year — 1 am at 8 the Colours were hoisted on Hunters Island it being New Year's Day. this morn Rogers Mr. Hopleys servt went into the Bush and took dogs with him and a gun at 5 pm all the officers Civil and Military dind with Lieut Lord not being very well I came away early
Sent my Man with the Govnrs Keeper and 2 of the Boats Crew up the River in my boat with my Dogs.

Thursday C.S. Collens — 2 am at ½ past 4 I waited upon His Honor the Lt. Govnr. at ¾ past we with Mr. Bowden the 1st assistant Surgeon and Mr. Harris the Surveyor walkd to the Governmt Farm where we Breakfasted at 7. we got in to the Govnr 6 oar Boat and went up the River to the first Fall where we arrived at half past 5. a distance about 40 miles from Hobart Town there we had two Huts built at ½ past 6 we sat down to a very excellent dinner, everything provided by the Governr but the Kangarro My man met us with a very fine one killd in the Morn, the same eve my man went out and killd a very fine Kangarro which I supplied all the Servants and men with.
The Govnr and self slept in one Hut and Mr. Harris and Mr. Bowden in another.

Friday C.S. Success — 3 am at 5 we Breakfasted and we all set off up the River on foot about 15 miles observing the Course of the River and the Hills and Plains, which were very extensive the River at the distance we went was very broad and a strong current we went to the first Cataract there we refreshd and returnd at 6 pm to dinner the men that were left behind caught some very fine Eels which we had for dinner and a very pleasant Eve we had.

Saturday C.S. Return — 4 am at 5 we Breakfasted and at ½ before seven we got into the Boats and went to Herdsmans Cove the Govnr and we walkd to see the plains which were very extensive at 2 pm we dind and got into the boat and came to Hobert Town where we arrived at at 8 after an one of the pleasantest excursion that I ever took, I never see the Govnr so comfortable and paid every attention to us that was possible.

V.D.L. Hobert Town January 1806

Sunday C.S. Cataract — 5 am divine service was not performd at 1 pm I waited upon His Honor the Lt. Govnr—at home all the aft

Monday C.S. Edmonton — 6 am at 11 I went out afishing 1 pm Mr. Bowden calld upon me Bowers a man that was absent in the Bush was taken and brought in.

Tuesday C.S. Waltham — 7 am at home all the morn 2 pm G. P. Harris Esq calld upon me

Wednesd 8 am at 12 I went out afishing and Lt Johnson servants
C.S. returnd from Browns River, and brought in a native Girl
Wormley with them

Thursday 9 am at 4 I went in my boat down the River and caught
C.S. some crayfish returnd at 6 pm
Harvest This day the Harvest began at the Government Farm

Friday 10 am Early this morn the little Native Girl which was
C.S. brought into Hobert Town made her escape out of a window
Ware at Wiggin's a marines with whom she livd

V.D.L. Hobert Town January 1806

Saturday 11 am this morn I began to have my Wheat cut. at 1 pm I
C.S. walk to the Govmt farm. a very fine crop they have got.
Arrington

Sunday 12 am at ½ past 6 the Royal Marine Barracks caught fire and
C.S. one end was consumed. at 11 performd divine service
Huntingdon the Military did not attend. the Country on fire on the
N.E. side of the River and likewise on the N.W. by
Millers and the Government Farm by the Natives

Monday 13 am Sent my Men to the Pitt Water aKangarroing at 3 pm
C.S. the Country on fire by the Natives with makes it very hot.
Norman Cross at Hobert Town all the Settlers very busy in Harvest

Tuesday 14 am at home all day the wind blowing very hard from the
C.S. S.W. pm do. w. with some rain
Sanford

Jan.

Wednesday 15 am the wind continued all this day with thunder and
C.S. lightning at 3 pm Rain every body busy in Harvest
Newark

Thursday 16 am at 10 Lieut Lord and his friend and self went in my
C.S. boat up to Risdon where we dind, at the Cottage in the
Carlton Garden olim Mr. Browns. At 6 pm we got into the Boat
and came to Hobert Town

Friday 17 am at home all the morn 5 pm a strange Boat arrived
C.S. from a schooner belonging to Cable and Underwood of
Markham Sidney
the Mercia

Saturday 18 am at 9 the Colour were hoisted at Hunters Island in
C.S. Honor of the day. This morn anchord the Mercia schooner
The Queen from Pt Dalrymple at 12 the Royal Marines fird 3 vollies
and a Royal Salute of 21 Guns were fird by the artillery.
the day very cold and wet

Sunday 19 am at 8 anchord in the Bay the ship Sophia Mr. Wm
C.S. Collens from Sydney the day very cold and wet by the
Sophia Sydney we received 1110 Bushells of Maise from Sydney

January 1806

Monday 20 am at 8 snow upon the Mountain this morn I receivd
C.S. 30 Gallons of Brandy. the day cold and wet, busey in
Mercia harvest

Tuesday 21 am This morn saild the Mercia schooner and by her I sent
C.S. letters to Capt. Houston &c &c. The General Order Jan
Reward 21 1806 His Excellency the Governor in Chief has been
pleasd, at the recommendation of the Lieut Govnr to grant
a Conditional Emancipation, bearing date the 18 day of
Dec. 1805 to each of the five following persons Viz.

John Ronaldson
Urias Allender
Christopher Forsha
David Wakefield
Wm Thomas

In consideration of their good conduct, and for volunteering their services by going in a six oared Cutter from Port Phillip to Port Jackson to announce the arrival of H.M. Ship Calcutta from England with an Establishment to form a Settlement at that place under the direction of the Lt. Govnr. N.B. Mr. Wm Collens had the command of the Cutter and when he was out some distance from Pt Phillip he coasted it and ran into every place for shelter he could, when the Boat was out and met with a strong breeze he turnd too and got very drunk leaving the Boat to the care of the Prisoners and about 80 or 100 Mile from Pt Jackson he got on board the Ocean Transport which saild from Pt Phillip for that place

January 1806

Wed. 22 am at 11 the Magestrates met to try the several prisoners
C.S. that absconded from the Colony
Doncaster Escaped

Wm. Roberts } 28 Oct. 1805 Ret. 3 Jan. 1806
Joseph Woolley } do. — — Red. 20 Jan. 1806
Thomas Story 24 Nov. 1805 Ret. 3 Jan. 1806
—Nelson—20 Dec. taken 9 Jan 1806
D. Gibson
Adam Carmichal
Coatsworth } 21 Dec. Ret. 20 Jan 1806
Morris
Wm. Bowers—22 Dec. taken 9 Jan. 1806
John Rogers } 30 Dec Ret. 15 Jan. 1806
J. Campbell } . . . Ret. 20 Jan 1806

Each of the Men were sentenced to Receive 300 each and to be worked in Irons for 1 year.

[Here one page, containing entries from 23rd to 31st January, has been cut from the Diary]

February 1806

Saturday 1 am at 6 the Sophia went out of the Bay and anchord in the middle of the River
C.S.
Newton

Sunday 2 am at 11 performd Divine Service His Honor did not attend the day very hot 8 pm much lightning and at 9 a severe tempest which continued till 11
C.S.
Sophia

Monday 3 am at 11 I went out afishing had very bad success. Busey in getting the house down which I bought of Mr. G. P. Harris the country on fire on the E. side of the Bay
C.S.
Beeford

Tuesday 4 am engagd this morn upon Business between Mr. Hopley and Kelly his Honor the Lt. Govnr came to the Court when Capt. Sladden and self were there at his request I won *Forshaw* an evidence to what he had Deliverd to the Court. The Lt. Govnr said that when he was Judge advocate he always did sware them the whole of the proceedings were read to him while he was in the Court.
C.S.
Berwick
Forshaw a conditional Emancipated Man

this morn all the Military refused taking the provisions according to the order of the Lt. Gov. the order was for each man 6 lbs Maze 5 lbs Meat(1) 2 lbs Pork. 6 ozs Sugar

February 1806

Wed. 5 am at 12 Mr. Harris calld upon me. at home all the day busey in harvest, the day very hot much in want of rain this morn the military had their provisions, but the order was changed, the ration for them is 4 lbs Flower 6 lbs wheat 4 lbs Pork 12 oz Sugar
C.S.
Linton

Thursday 6 am at home all the day
C.S.
Leith

Friday 7 am this morn finis'd carrying my Wheat and began to threshing my seed wheat
C.S.
Edingborough

Saturday 8 am the morn very hot at 2 pm it began to thunder from the West ½ past 3 heavy Thunder with moderate rain this morn I bought 1 lb of Tobacco and gave 1£ sterling for it I got all my Wheat up and gave the men a good dinner and Spirits at 7 it began to lightning ½ past 8 it increasd very much At 9 I went out and the lightning was the most severe we ever had it on the colony and the Thunder the most awful all my men very D— . . at the rain continued from 9 to 12.
C.S.
Kincross

(1) ? 'Meal'.

February 1806

Sunday 9 am at 2 the Tempest continued at a distance it went to
C.S. the N at 8 the air very cool and the ground much refreshed
Rosefield after the great drought. At 11 performd Divine service
Steward
Cowlan This morn the following men went away with a Government
Harris Black cutter Flinders olim and they took Blinkworth the
Wisdon settlers part of the way to Sandy beech to take their
Fennander things down in it.
Carrot
Brown

Monday 10 am early this morn more rain at home all the day sent
C.S. my men out with my Dogs aKangarooing
Forfar

Tuesday 11 am at home all the day at 7 pm My men returnd and
C.S. brought home Spott dead he had ran a Kangarro and killd
Aberdeen it. When the man came to the place where they see him
last he laid dead

Wed. 12 am this morn had my famous Dog Spott opend and found
C.S. that he had receivd an inward blow from which his death
Trent was occasiond.

Thursday 13 am at 6 I went down the River in my boat afishing and
C.S. stayd till 6 pm had very bad success
Tees

February 1806

Friday 14 am at home all the day
C.S.
Valentine

Saturday 15 am this morn engaged upon Business at 2 pm went out
C.S. afishing no success
Tyne

Sunday 16 am at 11 performd Divine Service. at 1 pm a very strong
C.S. N.W. wind and exceedingly hot 3 pm do. wr. the aft and
Blyth Eve was very hot and a large fire near Hobert Town
toward the Farm

Monday 17 am at 12 I calld upon Lt. Govnr Collins when he informd
C.S. me that he was going to send a letter to the officers at
Tweed 4 pm Mr. Fosbrook and Mr. Bowden calld upon me this
day a Whale Boat belonging to Messrs. Cambel & Co was
upset in the River and 2 men lost in it. I had permission
to go down the River.

Tuesday C.S. Markham 18 am at 6 I got into my boat with 4 Men Earl and Gains, my men Clark and Williams. McCauley servant and a Government man went down the River with a fine breeze at 9 we got to Storm bay passage ½ past 12 at Green Island the wind blowing very fresh at 3 we were in the River Houin. at 4 opposite Gardners Island ½ past we landed made a fire and dressd some dinner

Feb. 1806

sent my man out with my Dogs after Kangarros but no success went out fishing and caught some. We slep on the Sandy beech a very fine night,

Wednesday C.S. Dee 19 am early this morn sent my man out with our Dogs no success some went out afishing caught some very fine Fish which we dressd for Breakfast at ½ past 8 we made a start for the Point where the Sassifrass tree was we got there at ½ past 12 a very strong Breeze at 3 see a Black swan made sail after it and caught it. Dressd one for dinner which we caught as we were going up the River at 5 blowing hard.

Thursday C.S. Abberley 20 am we Breakfasted at 4—At 6 got into the Boat at that time some Swanns came opposite the Point made sail after them and caught 4. at 7 we bore up to the Western side of the River 12 got to Houin Island and went on shore ½ past the wind came so strong that it was impossible to get forward was obliged to go back to the Bay by Gardners Island at 4 made a fire dressd a swan and fish. slept there a very cold night at the farther end of the Bay we found a run of water and some distance got the boat up filld our casks of very fine water.

Friday C.S. Raynshay 21 At 3 am we got into the boat and rowd to Green Island where we landed at 7, ½ past got into the Boat and went part of the way through Storm bay Passage made fire and Breakfasted at 12 we got into the boat again and got into the large Bay on the S.W. side of the passage sent the man out aKangarroing My Bitch Miss came to me and we see she had killd a Kangarro she took me to it though it was near dark Slep there all night

Saturday C.S. Wykeham 22 At 4 made sail through the passage, when we got near the Western Bay we see two Catermarans with Natives in them they put back as soon as they see us their Catermarans were made of Bark at 9 we got in the Derwent went to Brown River where we caught some fish dressd it for Breakfast at 1 made sail for Hobert Town when we landed at 4 pm 7 I calld upon the Lt. Governor—

Sunday C.S. Wotton 23 am at 11 performd divine Service At 4 pm dind with His Honor the Lt. Govnr.

Feb. 1806

Monday C.S. Woolly	24	am at home all the day exceedingly hot Lt. Lord Mr. Bowden Mr. Fosbrook dind with me at 4 pm at 8 the Thermometer stood at 75.
Tuesday C.S. Woodbridge	25	am this morn engaged upon business at ½ past 12 the Lt. Govnr askd self and Capt. Sladden to take some wine the Lt. Govnr said he would lend me 4,000 bricks and to pay him when Croft made me some
Wed. C.S. Woodsend	26	am at home all the morn 1 pm I went with my men to the Government farm they went aKangarroing
Thursday C.S. Woodberry	27	am at 11 My Men returnd and the Bitch Miss kild 4 large Kangarros and they brought home 1 duck very great sucess in Killing the Kangarros the ground being so hard without rain
Friday C.S. Witton	28	am at 9 I went down the River afishing ½ past 1 pm made sail to come home but the wind blowing in strong Gusts we were obliged to return and anchor. 3 made sail and got home 6 pm

March 1806

Saturday C.S. Wales	1	am at 8 the Colours were hoisted on Hunters Island in honor of St. David's Day the day very hot from the N wind blowing all day very hard At 10 pm a little Rain
Sunday C.S. Wintersloe	2	am the morn very wet divine Service could not be performd at home all the day omne Nocte a sharp frost this Eve Cole the Marine discoved in a Robbery at H.M. Stores
Monday C.S. Wingfield	3	am at 11 went out afishing in my boat caught very few
Tuesday C.S. Windsor Castle	4	am at home all the day 5 pm I took my boat and went afishing. This Eve I bought a Pumpion for which I gave 9 shillings
Wed. C.S. Wyndham	5	am at 1 pm a small quantity of rain fell at 4 pm went out afishing
Thursday C.S. Winchester	6	am the day very fine At 12 calld upon His Honor the Lt Governor. 7 pm the boats crew drew the net opposite my House and caught very fine Mackerell some were sent me the this eve.

Friday 7 am at 9 His Honor went down the River with Mr P. to
C.S. Ralphs bay at 6 pm they returnd.
Governr Collins

March 1806

Saturday 8 am at 12 I walkd to the farm and returnd home to dinner
C.S.
Winchelsea

Sunday 9 am at 9 rain, 11 Do. wr. that Divine Service could not be
C.S. performd. Everything is burnt up for want of the Rain
Wimbledon at 12 My Man returnd from up the River and brought
home 7 Kangarros 2 Ells and a Duck and Pigeon. pm 2
a very fine shower of Rain and very greatly wanted

Monday 10 am at 11 I went down the River to get some Rafters &c
C.S. for a House and caught some very fine Mullet. Returnd
Wilmot at 5 pm

Tuesday 11 am at 11 I waited upon His Honor the Lt. Govnr and in
C.S. the Eve went afishing
Willoughby

Wed. 12 am at 11 I got into my boat with my Dogs and men and
C.S. went up the River under Mount Dromedary where we dind,
Willis at 5 went out with my Dogs and Killd a Kangarro but
could not find it Slept at the Bottom of the Hill

Thursday 13 am Early this morn Gains went out with my Dogs and
C.S. Killd 2 Kangarroos we Breakfasted and went up the
Willett River much higher. got there at 3 pm dind and went out
with my Dogs. Killd a Kangarro slept there

March 1806

Friday 14 am at 5 we got into my boat and came down the River.
C.S. Breakfasted at the Bottom of Mount Direction at 12 made
Wilkins sail under Bedlam Walls where I anchord the Boat and
caught some very fine Fish. At 5 got to Hobert Town

Saturday 15 am this morn Engaged upon business till very late. at
C.S. home the remainder of the day
Wickham

Sunday 16 am at 11 performd Divine Service At 4 pm I dind with
C.S. His Honor the Lt. Govnr
Whitworth

Monday 17 am at 10 the weather very cloudy went out afishing caught
C.S. very few. at 7 pm the Boats Crew drew their seine opposite
St. Patrick my House and enclosed so many Mackerell that with
difficulty they could draw the net on shore.

Tuesday 18 am at 10 it began to rain which was very greatly wanted
C.S. 11 My men went up the River with my Dogs. 12 very
Supply fine Rain All the Prisoners supplied with Mackerell the wet continued all the Eve at 9 pm one remarkable loud clap of Thunder and the Lightning before it was the longest I ever see

[Here one page, containing entries for 19th to 30th March, has been cut from the Diary]

Monday 31 am at home all the day A great quantity of Rain
C.S.
Wescott

Tuesday 1 April 1806
C.S. Upon Business all the morn do. wr.
Wentworth

Wednesday 2 am early this morn my men went out with my boat and
C.S. unfortunately they ran the Boat on the Rocks I took a
Wellwood govnt boat and went to their assistance

Thursday 3 am the wind blowing hard from the South and rain at
C.S. intervals
Willby

Friday 4 am Good Friday at 11 performd Divine Service. 1 pm
C.S. my men made a Signal took the New Boat which the Govnr
Wedgewood had made for Green & Trim his Govmt Game Keepers at 8 am a Native Girl about 17 was in my Garden the first that I ever see near me She ran away some small distance and then stopd. I went to her, she wanted some fire which got for her and some Fish and Bread, but returning to get some more fire she ran off. I see no more of her At 6 pm the Lt. Govnr calld upon me

Hobert Town April 1806

Saturday 5 am at 11 I took Mr. Clarks boat and went out afishing
C.S. very little success
Webber

Sunday 6 am at 11 Performd Divine Service 4 pm I dind with His
C.S. Honor the Lt. Govnr—in the Eve rain
Longford

Monday 7 am the morn wet I went out in my boat but she was so
C.S. bad that I was obliged to come home
Langley

Tuesday 8 am at home all the morn upon business
C.S.
Lough

Wed. 9 am Early this morn I went down to Brown River and returnd late in the Eve
C.S.
Twyford

Thursday 10 am this morn I went down to Brown River for my Man that I left Kangarroing
C.S.
Reading

Friday 11 am this Day a Whale was seen in the River near Ralphs Bay
C.S.
Cork

Saturday 12 At 11 I went down the River and met Mr. Oxley coming up in his boat I took him in my boat and came up with him to Hobert Town I carried him a Kangarro &c &c. at 5 pm the Estremina schooner anchord in the Bay. the Military that went to Sydney in the Sydney
C.S.
Johnson
arrivd at Hobert Town

Sunday 13 am at 9 James Keting a Cooper from Port Dalrymple landed under the care of James McCauley who acted for the time as Provost Marshall. This unfortunate man had been tryd at Sydney and found guilty of death and one [ ][1] a Soldier in the New South Wales Corps these men suffer death for robbing His Majestys Stores. I attended James Keting all this day till near 11 pm
C.S.
Oxley

Monday 14 am at day light I went to see the said James Keting and continued with him till 8. ½ past I went to him again and administered the sacrement, Continued with him. We went together to the place of execution. He prayd fervently and was truly prepared to meet his unhappy fate. At 10 he was numbered with the dead. He was attended at the awful Tree by His Honor the Lt Governor and all the military officers and some of the civil. the military and all the convicts attended the melancholy sene At 4 pm Capt. Sladden Lieut Johnson and Lieut Lord and Lieut Oxley R.N. and self dind with His Honor the Lt. Governor.
C.S.
Example

April 1806 Hobart Town

Tuesday 15 At home all the day. The day wet and blowing fresh from the S.E.
C.S.
Hungerford

Wed. 16 am at home till 1 pm. I took my boat and went out afishing, very bad success. At 4 it began to blow and rain which continued some time with thunder and lightning Lieut Johnson and Oxley calld upon me
C.S.
Overton

Thursday 17 am at 9 Capt, Sladden Lieut Johnson and Lord with Lieut Oxley breakfasted with me. At 4 pm I dind at Mr. Fosbrooks and met all the civil officers with Lt. Johnson and Lt. Oxley came home early
C.S.
Marthfield

(1) Name omitted.

Friday 18 am the morn very fine at home all day
C.S.
North

Saturday 19 am upon Business this morn. At 4 I dind with Lt. Lord
C.S. and met Lt. Oxley and Johnson with Mr. Bowden
Depart

April 1806

Sunday 20 am performd divine service. At 5 I dind with Capt.
C.S. Sladden met Lt. Oxley & Johnson there the Lt. Govnr
Monckton promised me to set up my oven

Monday 21 am at 7 saild the Estremine, Lt. Oxley at 5 pm I dind
C.S. with Lt. Johnson met Capt, Sladden Lt. Lord, Mr; Fos-
Oxley brook and Mr. Bowden in the eve a great quantity of rain
Sent letter to England per Estremine.

Tuesday 22 am this day kangarro was taken into H.M. Stores my
C.S. men went out in the eve rain, opposite my house at 7 pm
Supply they took a great quantity of fish, more than has been
caught this season

Wednesday 23 am a quantity of rain fell this morn, 2 pm do. wr.
C.S.
Latham

Thursday 24 am Rain and the day very hot at home all the day
C.S.
Dudley

Friday 25 am do. wr. at home all the morn 1 pm I walkd to the
C.S. farm home to dinner
Calcutta

Sat. 26 am this morn my Men came home from Kangarroing very
C.S. poor luck I put 2 into the Stores and keept 1 Emew and
Ocean a Kangarro.

April 1806

Sunday 27 am Divine Service could not be performd
C.S.
Walsall

Monday 28 am the day very cold
C.S.
Tamworth

Tuesday 29 am at 7 very cold and a little snow the mountain had
C.S. much upon it 9 blowing very fresh from the S. West
Ashborn ½ past 2 pm the mountain was coverd with snow at 8
the night very cold

Wed. C.S. Burton — 30 am Early this morn blowing hard from the N.W. at 8 the Mountain coverd with snow the day very cold and strong N.W. wind

May 1806 Hobert Town

May Day C.S. Derby — 1 am the morn very cold with slight snow at 9 blowing very fresh from the N.West. in the Eve blowing very hard with much snow.

Friday C.S. Nottingham — 2 am at 11 my men came down the river and brought 9 Kangarros and an Emew the Emew I gave to His Honor the Lt. Governor—blowing very fresh this morn from the N.W. at 3 pm more moderate at 8 rain with much snow

Saturday C.S. Westwood — 3 am the day very cold and blowing hard from the S.W. at intervals I bought a Pigg of Mr. Lord for 1.10

Sunday C.S. Mansfield — 4 am the morn very wet Divine Service could not be performd this morn I spoke to the Lt. Govnr again about Sharrard the Govmt Mason that was sent down to work at Mr. Collins

Monday C.S. Uxbridge — 5 am the day Blowing very hard and snow at intervals my Men went up the River I bought a Pigg of Willis £3.

Tuesday C.S. Wycombe — 6 am this morn Sharrard the Govmt Bricklayer came to work at my Oven my having been promisd him more than a fortnight back by the Lt. Govnr himself, but he was sent down to work at Mr. Collins for 2 days only and was Keept by Mr. C. there at work for a fortnight but 2 days
vide Sunday 4

May — Hobert Town V.D. Land 1806

Wednesday C.S. Newton — 7 am this morn very fine after the Gale which we have had for some days

Thursday C.S. May — 8 am the day very fine I walkd to the Govmt Farm and came home to dinner

Friday C.S. Oxford — 9 am Early this morn my Man Gains came home from Kangarroing At 1 pm I went up in my boat with him to the Farm Point landed and walkd home to dinner
151 lbs Kangarro

Saturday C.S. Abbingdon — 10 am the day very fine at 4 pm Raind this aft. Hunter and Roberts made their escape from the Watch house at 8 Lightning from the West

Sunday 11 am the morn very rainy at 11 Do. Wr. Divine Service could not be performd at 4 pm I dind with Lt. Lord met Mr. Bowden at 8 much Lightning
C.S.
Taringdon

Monday 12 am this morn engaged upon business my men came down from Kangorooing and returd some into the Stores The day very cold
C.S.
Burford

May Hobert Town V.D. Land 1806

Tuesday 13 am the morn wet At 7 pm we heard a Gun fird at 8 anchord in the Bay the King George Whaler Capt Moody the Lt. Govnr sent a boat on board and by the ship arrived the Deputy Judge Advocate Mr. Bate He came on shore waited on the Lt. Govnr and went on board the same Eve I received letters from the judge advocate. came in the Wm. Pitt from England to Sydney. 11 monts on her passage
C.S.
Letters &c.
Spender & McTustin

Wednesday 14 am at 12 Capt. Sladden and the Judge Advocate calld upon me at 1 pm I waited upon the Lt. Govnr we were informd of Ld Nelsons Victory and the Cape being taken I received Letters and a Box
C.S.
Bate
Mrs. P.

Thursday 15 am this morn at 11 the Lt. Govnr sent for me and we took some Port Wine
C.S.
Arrival

Friday 16 am at 8 I see three Boats from the King George whaler off after whale in the River
C.S.
William Pitt

Saturday 17 am the day very fine at 11 I took a walk to Sandy Bay and Killd some Wattle Birds at 4 pm Mr. Hambleton of the King George whaler dind with me.
C.S.
Wales

May 1806

Sunday 18 am at 11 performd Divine Service attended by the Lt. Govnr &c &c. the D.J. Advocate at Church being the 1 Sun after his arrival at 4 pm I dind with the Lt. Govnr saild the King George Whaler to Frederic Henry Bay awhaling
C.S.
Blith

Monday 19 am the morn I calld upon Capt and Mrs. Sladden the Judge Advocate at the Captains House at 2 pm rain
C.S.
Supplies

Tuesday 20 am the day very fine at 12 I calld on Capt Johnson 6 pm He calld on me and supd with me I shot some Wattle Birds and sent them to the Lt Govnr
Parole
North Creak
C.S. " Stowe "

Wed. C.S. Stroud	21	am at 11 I went out with my Gun and took Ch Williams a prisoner about 3 miles from the Town and I shot a Kangaroo 5 pm Capt Johnson and his friend dind with me a very sharp frost this morn
Thursday C.S. Tewkesbury	22	am the day very fine at 4 pm I dind with His Honor the Lt. Govnr and met Capts Sladden and Johnson and the Deputy Judge Andvocate
Friday C.S. Severn	23	Dr. Wr. at 5 I dind with Capt Johnson at home all the Day
		May 1806
Saturday C.S. Trent	24	am at home all the day. the wr. remarkably fine
Sunday C.S. Birdwood	25	am Whitsunday at 11 performd Divine Service all the Feamale Prisoners attended, a very fine[1] congregation
Monday C.S. Weston	26	am at 11 I went out afishing caught some very good Rock Codd—5 pm the Judge Advocate James Bates Esqr Captains Sladden and Johnson dind with me
Tuesday C.S. Ledbury	27	am at 5 rain 11 clear at home all the day No
Wed— C.S.	28	am the morn I went to the Govmt Farm upon business at 5 pm Lt. Lord Dind with me
Thursday C.S. Restoration	29	am a sharp frost this morn at 12 the Judge Advocate calld upon me
Friday C.S. Monmouth	30	am The Magestrates met by order of a General Order Examine into the State of the Colony and to adobt the best manner for the safety of the Colony and to regulate the high Price of Provisions and examine the Bakers &c &c
		June 1806
Saturday C.S. Bricknock	31	am the day very fine at 12 I went out afishing for a little while. In the Eve much Lightning

(1) 'fine' may be 'ful'.

Sunday 1 June
C.S.
Cardiff

am the morn very cold at 11 performd divine service At 1 pm Mr. Wm. Bowden calld upon me. The Lt Govnr unwell. I calld upon the Govnr

Monday 2
C.S.
Rejoice

am at 11 I walkd to the farm with Mr. Bowden and returnd at 4 pm I calld upon the Lt. Govnr, and he was better

Tuesday 3
C.S.
Milfordhaven

am the day very fine at 5 pm I dind with Mr. Bowden and met Lt. Lord Mr. Fosbrook and Mr. Janson calld in the evening

Wed. 4
C.S.
The King

am at 8 the Colours were hoised on Hunters Island in Honor of the Day. At 12 the Military fird three Rounds and a Salute of 21 Guns were fird in Honor of the Day. At 1 self Capt. Sladden Johnson Lt. Lord paid our respects to His Honor who though very ill receivd us and took some wine with him. The day was remarkably fine

June 1806

Thursday 5
C.S.
Enfield

am I waited upon His Honor who was better.
I dind with Capt, Johnson at 5 pm

Friday 6
C.S.
Barnet

am early this morn I went to Ralph's Bay with my gun had very bad success returnd in the Eve at 7 to Dinner I observed a strange sail in Frederic Henry Bay

Saturday 7
C.S.
St Albans

am this morn the Judge Advocate and Majestrates met upon Business At 5 pm I dind with Mr. Fosbrook and met the Judge Advocate Mr. Harris and Mr. Janson Bowden. I gave information to the Govnr of the ships in Frederic Henry Bay

Sunday 8
C.S.
Watford

am Divine Service could not be performd at 10 three Whales in front of my House Mr. Collins sent 2 boats after them at 4 I dind with the Lt. Govnr. 6 Mr. Collins sent word to the Govnr that he had killd one of the Whales in Farm Bay a very cold day The Lt. Governor sent a Boat down into Frederic Henry Bay to see what ship it was

Monday 9
C.S.
Dunstable

am at 8 this Morn Mr. Collins men with 2 boats had the Whale in tow down the River to the Try works the Weather very fine in the Eve the Govmt Boat returnd from Frederic Henry Bay—the Ship was the Carlton Privateer from Liverpool the Capt was to come up as the next Morn to wait upon the Lt. Govnr

June 1806

Hobert Town Van Diemens Land

Tuesday 10
C.S.
Coventry

am at 12 the Lt. Govnr sent to me upon business the Capt of the Carlton came to Hobert Town and waited upon the Lt. Govnr

Wednesday 11 am this morn we had the severest frost we have experienced
C.S. in this country this day His Honor the Lt. Govnr keept
Carleton the anniversary of His Majesty's Birth being unwell on
Parole Halcrow the 4 of June at 12 the Military Paraded and fird 3
vollies and a Royal Salute was fird from the ordnance
at 5 all the Civil and Military dind with the Lt. Govnr
and Capt. Halcrow of the Carlton Letter of Mark from
Liverpool

Thursday 12 am Capt. Halcrow of the Carlton Breakfasted with me.
C.S. at 5 pm the Capt. and Mr. Lord dind with me this morn
Bedford I calld upon the Lt. Govnr

Friday 13 am the day very fine at 12 I went out and killd some
C.S. Wattle Birds pm Some Whales opposite the Town
Broughton

June 1806

Saturday 14 am this morn the magestrates met upon business
C.S.
Willingborough

Sunday 15 am at 12 the Lt. Govnr sent for me upon business and
C.S. I soon after sent Sargt M.Cauley, Billingham Perry and
Northhampton in search of 2 Prisoners that we absent from the camp
Hobart Town

Monday 16 am at 11 I took my boat and went out afishing. Had
C.S. very good luck Capt Johnson's 2 Men came from Pitt
Deventry Water and informd his Master that Brown one of his
men was wounded by a spear which the Natives had
thrown at him and killd 2 Doggs and wounded one. The
Natives took 3 Kangarros from the men at 5 pm Capt
Johnson Lt. Lord and Mr. Bowden dind with me

Tuesday 17 am this morn much Rain and blowing fresh from the South
C.S. my men went up the River with my Dogs. at 11 a Gale
Royal Marines of wind from the S.W. in the Eve Do. Wr.
Parole
Buncars Hill

Wed. 18 am this morn blowing very hard with rain
C.S.
Tempest

June 1806

Thursday 19 am at home all the day busy in my Garden at 1 pm
C.S. I calld upon the Lt. Govnr
Leicester

Friday 20 am at 12 Lt. Lord and self walkd to the Farm upon busi-
C.S. ness at 5 pm he dind with me very cold in the eve.
Mowbray My men brought home 9 Kangarros.

Saturday 21 am the Wr. very cold and a sharp frost this is the
C.S. shortest day in the year at 11 I calld upon the Lt. Govnr
Nottingham ½ past went to the Court where the Magestrates were upon business at 5 pm I dind with Capt and Mrs. Sladden met Capt Johnson the wr. very cold.

Sunday 22 am the day very cold at 12 Cap Johnson calld upon me and
C.S. we took my Glass and observd 2 Boats of Mr. Collins fast
Buxton to a Whale ½ past 1 we calld upon the Judge Advocate 4 pm I dind with His Honor the Lt. Govnr this morn the Lt. Govnr sent a Boat into Storm bay passage to see if there were any strange ships there

Monday 23 am at home all the day. My men went out with my Doggs
C.S.
Langley

Tuesday 24 am the day fine but very cold at 3 pm a Boat arrived
C.S. from Adventure Bay from the Ocean Whaler Capt Bristow
Judbury at 5 pm I dind with Capt Johnson and met Capt. Sladden and Lt. Lord

June 1806

Wed. 25 am at 11 the Magestrates met upon business, many whales
C.S. in the river.
Antrobus

Thursday 26 am at home all the day. very fine wr. but Cold
C.S.
Ocean

Friday 27 am at 3 pm Cap Halcrow came up in his boat and brought
C.S. a man with him that was wounded by a Whale he dind
Macclesfield with the Lt. Govnr

Saturday 28 am at 9 Capt Halcrow calld upon me at 5 pm he dind
C.S. with me and Capt. Johnson and Lt. Lord. In the Eve
Macclesfield much rain

Sunday 29 am Do. wr. at 9 I Breakfasted with Lt. Lord the day fine but very cold at 5 pm Capt Halcrow and self dind with Lt. Johnson

Monday 30 am this morn Capt. Halcrow went down to his ship. at
C.S. 8 pm Capt Johnson and self dind with Lt. Lord.
Bolton

July 1806

Tuesday 1 am at ½ past 8 Capt Johnson and Lt. Lord went down in
C.S. my Boat to Storm Bay Passage to go on Board the Ocean
Blackburn whaler Capt Bristow at 10 pm they returnd and in coming back the Boat was chased by a Cow Whale. She struck at the boat but fortunately she did not hit it with her fins.

Wed. C.S. Preston	2	am at 12 I took my dogs out to kill a Kangaro I see only 1 Bush Kangarro and the dogs did not kill
Thursday C.S. Kerkham	3	am A great quantity of Rain fell this morn at 11 I waited upon His Honor the Lt. Govnr. in the Eve Do. wr.
Friday C.S. Barton	4	am at 11 I went to Risdon in my boat the day fine at 4 I came home
Saturday C.S. Lancaster	5	am upon Business this morn the day very wet, and many Whales opposite the House
Sunday C.S. Kendal	6	am the day very fine but cold
Monday C.S. Penrith	7	am many Whales in the River at 4 pm Capt Halcrow came to the town from his ship and dind with me
Tuesday C.S.	8	am at 9 Capt Halcrow and self took a walk to the Govmt Farm and killd some Wattle Birds. Capt Halcrow and self with Mr. Bowden dind at Lt. Lord's
Wed. C.S. Carlisle	9	am this Morn a very severe frost at home all the day
Thursday C.S. Longtown	10	am I breakfasted with Lt. Lord and Capt Halcrow
Friday C.S. Edingburgh	11	am at 11 Capt Halcrow and self went out with my Dogs to kill Kangarro no success at 5 pm he and Lt. Lord dind with me
Saturday C.S. Gretna	12	am this morn we Breakfasted with Lt. Lord and at 3 pm Capt Halcrows 2 Boats came up the River in search of Whales. his Ship came from Frederic Henry bay and anchordd in the River
Sunday C.S. Glasgow	13	am at 11 I calld upon His Honor the Lt. Govnr at 1 pm Lt. Lord calld and Cap Johnson upon me 4 pm I dind with the Govnr
Monday	14	am at 12 I went with my Boat to the Carlton Capt Halcrow who was awhaling down the River at 3 pm I got on Board. They were busey in boiling the blubber 5 pm two Boats came up with a large Whale

Cole was punishd by order of the Lt. Gov. for stealing a copper tea kettle and selling it to Mrs. Thorne. Mrs. Thorne knew that it was stole from Mrs. Hobbs because Cole said a week before that he would get her one, and she paid Cole 7 or 9 Gills of Spirits for it. Cole

Tuesday 15 am at 10 Capt. Halcrow and self went on shore in my boat his Boats went off after whales 3 pm we got on Board. Lt. Lord came to the ship and Cap Bristo of the Ocean Whaler 4 pm Capt Halcrow Boats brought up a very large Whale

—set the boy Appleby to sel it to Mrs. Thore the boy livd with Thorne at the time

July 1806

Wednesd 16 am this morn blowing very fresh from the South we remaind all on board Capt Halcrow Boats out awhaling 4 pm the Boats returnd with a very large whale 5 moderate wr and Capt Bristo went on board his ship

Thursday 17 am the whale that they brought on board yesterday made
C.S. 90 Barrels of Oile. We dind on Board at 3 pm Mr. Lord
Gallowway and self came to Hobart Town In the Eve I suppd with Lt. Lord

Friday 18 am this morn I calld upon the Lt. Govnr. Capt Bristo at
C.S. Hobart Town Capt Moody of the King George Whaler
Glenlance came up

I put 1 acre of wheat in

Saturday 19 am at 9 Capt Bristow calld upon me. at home all the day
C.S. Capt Halcrow came up this aft and Capt Moody went to
Port Patrick his ship

Sunday 20 am at 10 the King George Whaler Capt. Moody anchord
C.S. in the Bay the distress of the Colony for want of Grain
Wendover that the Rations are as viz to the Officers 3 lbs of Wheat and 8 lbs of Kangarro. To the Prisoners 2 lbs of Indian Corn and 8 of Kangarro

July 1806

Monday 21 am at 11 Capt Johnson and Cap Halcrow and self walkd
C.S. to Sandy Bay. at 5 pm we dind with Capt Johnson and
Trig met Capt Sladden

Tuesday 22 am at home all the day Capt Halcrow dind with me
C.S.
Hardwick

Wed. 23 am this morn I went to Sandy Bay at 4 pm I dind with
C.S. Lt. Lord and met Capt Bristow.
Winslow

Thursday 24 am at 11 I walkd to Sandy Bay and returnd at 3 ½ past 4
C.S. Capt Johnson Lt. Lord and Capt Bristow dind with me
Banbury Mc sent for me late in the Eve

Friday 25 am at 3 some persons unknown set fire to the Hospital
C.S. with an intention to burn Bootham in it but fortunately
Discover he was awake when it first broke out. they set it on fire three places, everything was burnt in the Hospital 212

pairs of sheets besides Blankets and Bed. the Lt. Governor gave a General Reward this day of 100 Pounds & a free pardon and Passage to England if any one would discover the insenderies.
at 5 pm I dind with Capt. Johnson and met Capt Sladden & Lt. Lord

July 1806

Saturday 26 C.S. Attempt — am busey in sowing wheat this aft calld upon His Honor on business

Sunday 27 C.S. Oxford — am this morn much rain and very cold at 10 snow 4 pm do. wr.

Monday 28 C.S. Warwick — am the mountain covrd with snow at home all the day

Tuesday 29 C.S. Stratford The Red Cow Calfd — am engaged all this morn upon Magestrate business upon Newland &c at my House the day very cold at 5 pm Capt Halcrow came up to Town sent my letters to go with the Govmt dispatches

Wednesd 30 C.S. Dispatch — am at 4 the Govmt dispatches went down to the King George Capt Moody at 10 I went out with my Gun and killd a Kangarro Capt Halcrow and Lt. Lord dind with me at 5 pm
This morn saild the King George Whaler

Thursday 31 C.S. Avon — am at home all the day upon business

August 1806

Friday 1 C.S. Worcester — am at 7 Lt. Lord and self went in the Govmt Cutter to Capt Bristows ship in Storm Bay passage. at 3 pm we got into the boat again and Capt. Bristow came up with us We see a great many of the Natives both men and women they were friendly

Saturday 2 C.S. Bromesgrove — am busey this morn in writing letters

Sunday 3 C.S. Dudley — am engaged in writing letters to England. at 8 pm calld upon the Lt Govnr who took my letters and closed them with his Dispatches Mr & Mrs. P. Lt. Spencer Mr. Tustin Mr Collins,

Monday 4 am at 8 I see Capt Bristow who was going on board his
C.S. ship Mrs. Bate went as passenger and Mrs Folkoner the
Good Voyage Morn very cold. at 10 saild the Ocean Whaler from
Storm Bay passage for England Capt Bristow at 1 pm
I went out afishing at 3 it raind and was obliged to return.
8 do wr. which continued all night.

Tuesday 5 am at 4 I was informd that a ship was come from Sydney
C.S. the Estremina Brig with Provisions for the Colony Lt.
Simmonds Simmons in the H.M. Brig Estremina. at 1 pm informa-
tion was given that a ship was standing up the River.
3 pm she anchord in the bay the Criterion Capt Chace
from Sydney last cargo of Tea Nankein & China 5 pm
Capt Sladden Johnson Lt. Lord and Lt. Symonds dind with
me all very merry—and exceeding wet day. When the
Estremina arrivd we had only provision for 2 servings—
a weeks—

Wednesd. 6 am the Weather very wet by Lt. Symond we had the infer-
C.S. mation that the Venus brig commanded by Mr. Chace
Chace was taken by the Prisoners at Pt. Dalrymple and ran
away with. She had property to a very large amount
£10.000 both for Pt Dalrymple and this Colony. for me
there were 30 gls of Spirits and a Barrel of Porter

Thursday 7 am at home all the day very wet at 5 pm Capt Sladden
C.S. Lt Lord & Lt Simonds and self dind with Capt Johnson
Bridgenorth

Friday 8 am at home all the morn very wet I breakfasted on board
C.S. the Estremina Lt. Simmonds, 5 pm the same party dind
with Capt Sladden much wet.

Saturday 9 am at home all the day. this morn I sew some garden
C.S. seeds from England Peas and Beans altho the day very
Shrewsberry wet

Sunday 10 am at 12 Capt Halcrow calld upon me 2 pm saild the
C.S. Criterion the Merichan ship commanded by Mr Chace
Nantucket

Monday 11 am at 9 I went on board the Estremina Lt. Symonds to
C.S. Breakfast. at 11 Capt Halcrow calld upon me. 5 pm I
Return dind with His Honor Lt. Govnr Collins and met Capts
Sladden and Johnson Lt. Lord Lt. Simonds R.N. Capt
Halcrow of the Carlton Letter of Marque very busey at
work at my Garden

Tuesday 12 am at 8 the Colours were hoisted on Hunters Island
C.S. at home all day not well
Drayton

Wednesday 13 am busey at my Garden all day.
C.S.
Simon

Thursday 14 am at 8 saild the Estremina Lt Simmonds for Port Jackson. at 4 pm Capt Halcrow dind with me. I sent His Honor a young Pigg Capt Johnson & Mr. Bowden calld upon me
C.S.
Overton

Friday 15 am this morn busey at home. At 1 pm I calld upon His Honor Lt. Govnr Collins very busey in my Garden
C.S.
Denbegh

Saturday 16 am at home all the morn upon Business
C.S.
Chester

Sunday 17 am the morn very wet 4 pm I dind with His Honor the Lt. Govnr
C.S.
Flint

18
Mond. am the day very wet at 3 pm the Carlton Letter of Marque stood up the River at 6 she anchored on the East side of the River wind contra for her coming up—
C.S.
Holiwell

August 1806

Tuesday 19 am at 8 the Carlton Letter of Marque working into the Bay ½ past 11 she anchord and fird salute which returnd by the Garrison 1 pm Rainy and squaly weather. In the eve much lightning
C.S.
Halcrow

August 1806

Wed 20 am the day very wet and blowing hard in the Eve much Lightning
C.S.
Normans Cross

Thursday 21 am at 11 I calld upon His Honor the Lt. Govnr. 5 pm I dind with Capt Johnson and met Capt Sladden Lt Lord Capt Halcrow
Honour

Friday 22 am at 8 the Colours were hoistd on Hunters Island the Lieut Governor having appointed this day to be observed as a day 4 Thanksgiving, for the late glorious success which attended His Majesty's arms over the combined fleet of the Enemy off Cape Trafalgar on the 21 day of October last. Divine Service was performd and attended by Every Officer Civil and Military settlers free People and the prisoners, every person attended that were not prevented by sickness at 12 a Royal Salute was fird from the Ordinance on the Parade and Capt Halcrow fird a Royal Salute from the Carlton Letter of Marque, the day was very fine but cold
C.S.
Victory

August 1806

Saturday 23 am at 11 I waited upon the Lt. Govnr 12 the Govnr
C.S. Mrs P. and Capt Halcrow self went in his Cutter to the
Peterborough Farm where we dind and in the Eve returnd home to Tea
the day very fine

Sunday 24 [Here one day is cut from the original Diary]
C.S.
Boston

Monday 25 am the day very fine sowd an acre of Wheat and had it
C.S. Chippd in Capt Sladdens sale was this morn and one
Newark pound of Tea was sold at the enormous Price of Six
Guines a Pound and bought by Lieut Lord the day very
fine

Tuesday 26 am the day very fine busey in Chipping in some wheat
C.S. and making a hot bed the day very fine
Hull

Wed. 27 am at home all the morn busey in planting Pot 8os
C.S. all my men employd in my Garden at 4 pm I went with
the Lt Govnr in his boat on board the Carlton Capt
Halcrow to dinner when on board he fird a Salute of
9 Guns we spent the day very pleasant at 9 came on
shore when he fird a Salute again

Thursday 28 am at home all the day busey at my Garden in planting
C.S. Pot 8os and making beds for the Carrots which I sowd
Atton the seed came from England

Friday 29 At home all the morn 2 calld upon Capt Halcrow on board
C.S. the day very fine busy
Ashbourn

August

Saturday 30 am at home all the morn busy in planting and sowing
C.S. seeds in my Garden, at 5 pm I dind with the Lt. Govnr
Axminister and Capt Sladden and Capt Halcrow

Sunday 31 am this morn I went on board the Carlton Capt. Halcrow
C.S. to take some Ham &c &c at 4 pm Capt and Mrs. Sladden
Bampton embarkd on board the Carlton Letter of Marque Capt.
Halcrow, to take their passage to England Capt Sladden
being recalld by the admiralty to join his division at Chat-
ham

Memorandum ad Salisbury

September 1806

Monday 1 am at home all the day busy at my Garden planting
C.S. potatos. at 8 am I launch my new Boat calld the Spencer
Bangor

Tuesday C.S. Barnet — 2 am do employd Capt Halcrow calld upon me at 1 pm I went on board at 3 and took Ham &c. sent my new boat to be riggd.

Wed. C.S. Dispatch — 3 am this morn finished all my letters and at 1 pm took them on board sent my swans and at 4 pm went on board with Captain Sladden Lt. Lord Cap Halcrow to dinner. at ½ past 6 Captain Johnson came on board with the Government Despatches. the day very fine I put some of Coll Astleys Melons into the bed at 9 I came on shore with Capt Sladden to take leave of the Lt Governor &c

Thursday C.S. Carlton — 4 am at 7 saild the Carlton Letter of Marque for Liverpool Capt Halcrow and saluted with 13 Guns the day very fine blowing fresh at 10 from the N.W. at 1 I took my new boat and went out afishing very poor sucess

Friday C.S. Bedford — 5 am busey at working in my Garden sowing seeds &c. &c

Saturday C.S. Beverley — 6 am do employd all the morning in the aft I went out asailing. Blowing fresh 7 pm rain

Sunday C.S. Blackburn — 7 am at home all the day 5 pm I dind at Capt Johnsons at the new House which he hird of Lt Govnr Collins. Late Capt Sladden's House

Sept 1806

Mond C.S. Boulton — 8 am this morn I finish sowing the Wheat 4 pm Sowd Gooseberrys and Currents and planting Potatos.

Tuesday C.S. Brackley — 9 am at home all the Morn. 5 pm Capt Johnson and his friend dind with me

Wed. C.S. Brandon — 10 am busey in the Garden at 1 pm went up to the Farm in my boat and walkd home the day very fine Land and Sea Breeze.

Thursday C.S. Brentford — 11 am at home all the day busey in my Garden, everybody wishing for the arrival of a ship with provisions having only a fortnight's in the Store

Friday C.S. Bridport — 12 am at home all the day the mountain coverd with Snow

Saturday C.S. Broadway — 13 am busey upon business

Sunday 14 am the day very fine at 5 pm I dind with Lt Lord and
C.S. met Mr. Bowden
Birford

Monday 15 am ½ past (11)? I took a long walk with the Govr. 1 pm
C.S. took a Sail in my New Boat
Vigilance

Tuesday 16 am only Two Pounds of almond meal given out at the
C.S. Store for the officers per week and not a single Grain of
Buxton Corn or meal left for the Prisoners nor have we any more
in the store

Sept 1806

Tuesday 16 At sunset this Eve a Military Patrole was appointed whose
C.S. duty commences at the beating of the Retreat in the Eve,
Buxton and continues until Reviellie beating in the morning. the
military Patrole consists of 1 Sargt, 1 Corp, and 6 Privates

Wed. 17 am at home all the day with my men busy in the Garden
C.S.
Cullington

Thursday 18 am do employd every body much dejected having no pro-
C.S. visions to supply the Colony with the Lt Govnr went and
Cardiff returnd home to dinner

Friday 19 am at ½ past 11 I waited upon the Governor, busy in
C.S. sowing seeds &c in my Garden
Relief

Saturday 20 am at 11 the Lt Govnr sent his compts and requested I
C.S. would sit and Try some Prisoners. pm ½ past 2 Lightning
Chatham and Thunder with a little rain the day very warm put
some long Turkey Cucumbers into the Bed. Not an ounce
of Meal Wheat or any thing to be servd to the Military
or Prisoners, none in the Store for any one

Sunday 21 am at home all the morn 4 pm I dind with His Honor the
C.S. Governor. much rain all the aft and Eve
Carlisle

September 1806

Monday 22 am at home all the day the wr. very fine
C.S.
Chepstow

Tuesday 23 am at 9 I took my boat and went into Ralphs Bay ashooting
C.S. and killd a Black swan. saw some very fine Ducks but
Chudleigh could not kill any return home to dine at ½ past 7 pm
blowing very hard—

Wednesday 24 am at home all the day. Everybody impatient for the arrival of a ship
C.S.
Clare

Thursday 25 am this morn sent my men out after Kangarros and went myself afishing very good success
C.S.
Colford

Friday 26 am at home all the morning at 1 pm took my boat and went afishing caught but very few
C.S.
Cornhill

Saturday 27 am Engaged this morn upon the bench from 9 to ½ past 12 by myself,—the Prisoners very greatly distressed for provisions not any flower Meal or Maize in Store. this day things sold at the following price Biscuit 4s per lb, Meal 3s/6d do. Maze 2s/3d do. Tobacco not fit to be made use of 2s/6d per inch. the Cololy very greatly distressd for everything and every body crying out for the want of Bread, sugar 5s/- per lb, Rice 2s/6d and Kangarro at 1s/- per lb.
C.S.
Cowes

September 1806

Sunday 28 am this morn calld upon the Governor to thank him for some fine Mutton which he sent me. at 1 calld upon Capt Johnson
C.S.
Cranbury

Monday 29 am this morn went out afishing before Breakfast opposite my House caught a few. at 1 pm went out again it came on to rain so hard was obliged to return in the Eve Do. wr. the Drum beat the Taptoo at 9 am this Eve
C.S.
Crayford

Tuesday 30 am at 8 Blowing hard from the North the morn very cold after the rain at 11 upon business till very late
C.S.
Cromer

October 1806

Wednesday 1 am Early this morn the following Prisoners deserted from Hobart Town Wm Jones Jarret Tombs and Crute. the Morning fine after the Gale at 1 pm I went up the River with my Men as far as the farm, that Sculler might detect my Man Earl in using some of my seasond wood &c. for Bedsteads and table at 3 I returnd when Sculler informd me that he had taken Earl and with timber was putting the bedstead together In the eve I waited on the Gover and requested him not to punish Earl but begd of him to give him a reprimand the table was for Stoker and the bedstead though he would not acknowledge it
C.S.
Croydon

Thursday 2 am this morn at 10 the Govnr Releasd Earl with a reprimand at 1 pm I went out afishing and took Earl with me. In two hours opposite my house we caught in the Bay 5 Dozen of Rock Codd and I Dozen flatheads the weather was rainy and blowing a Gale from the W.N.W.
C.S.
Dalkeith

Friday 3 am this morn went out afishing had very bad success blowing hard from W.
C.S.
Danbury

Saturday 4 am at 6 this morn I went out afishing caught very few for Breakfast the distress of the town very great for want of Provisions scarce any Provision for the Marines and Prisoners, At 11 lent my new Boat to some Marines to get some fish having nothing else to eat Potatoes 2s a lb and Flower sold by Mr Bate the D.J. Advocate at 6s per lb. Mr. Collins this morn went upon Mount Direction to look for a ship the day very cold blowing hard from S. West. Caught very few fish amidst all this scarcity of Bread &c at this season we have scarce any vegitables the Potatoes are all in the ground
C.S.
Dartford

Sunday 5 am the Morn very cold blowing hard My Man and a party of Marines went out afishing had very bad success at 12 calld upon His Honor the Lt. Govnr he complaind very much for the loss of Kangarro none being in the Store and it is generally believed that the prisoners which are in the bush had taken many of the Gentlemens Dogs. the wind blowing very hard this morn a party of 5 went into the Bush blowing hard from the S. West.
C.S.
Deal

Monday 6 am the wind continued all night. at 1 pm blowing a very heavy Gale from the West at 3 M Mansfield came down to the Governor who informd him that there was a ship arrived in Frederic Henry Bay and that an officer of the R.Ms and Henry Hakin was at his house. the Lt. Govnr sent a Boat up for them the same Eve they landed the ship was the King George Whaler from Sydney
C.S.
Dover

October 1806

Tuesday 7 am at 10 Henry Hakin the Pilot calld upon me and informd me that the distress at Sydney was greater than here there were no Grain or Flower of any kind and that some People had died through want. at 1 pm I waited upon the Govnr who read me a letter from Govnr Blyth the new Govnr and likewise of the new Ministry in England. Mr. Fox Secretary for the Foreign Department and Ld. Spencer for the Home &c &c &c. at 2 Capt Johnson and Lt Henderson the officer which came from England calld upon me. Lt. H. came to relieve Capt. Sladden and that Lt Breedon who was on board the King George to relieve Capt Johnson who is recalld by the Admiralty. I had a letter from the Revd Mr Marsden a very great change of affairs in England
C.S.
Henderson
the New Officer of Marines

Wednesday 8 am at 9 I took my 3 Men with Guns and sent to kill a
C.S. Kangarro we had very bad success the ship did not arrive
Deptford came home at 5 pm

Thursday 9 am at ½ past 5 I sent my Men down to Browns River to
C.S. kill some Ducks &c &c at 10 sent my New Boat to Capt
Derby Johnson and Lt. Henderson to go down the River Capt
Johnson informs me that he was going to England by the
return of the King George. this day three years at 20
minutes past 10 am we arrived at Port Phillip

October 1806

Friday 10 am at home all the day, in the Eve we had a fine shower
C.S. at 3 pm arrived the King George whaler Mr Moody from
Breedon Sydney with a supply of Salt Provisions
the officer of Mar

Saturday 11 am upon business all the Morn at 1 pm I waited upon
C.S. the Lt Govnr Receivd a box from Salisbury and likewise
Moody letters from My Agents and Capt Bowen &c &c

Sunday 12 am at 11 Capt Johnson and Lt Breedon calld upon me
C.S. at home all the day
Doncaster

Monday 13 am at 5 went out afishing at 11 engaged upon business
C.S. I Xnd Mrs Sargents child and took lunch at Mr. Bowdens.
Dudley Waited upon the Govnr the day very fine, It is truly
lamentable to see the distress that the people are in not
a Man able to do any work, what few there are employd
in unloading the King George the Lt Govnr is obliged to
give them Pork and beef 4 lbs a man, all our Poultry are
dying having nothing to give them the poor Piggs &c &c
are all dying and at this Season we should have young
ducks and Chickings My poor pigeons are all most dead
for want of Provisions only 4 remaining out of 16

Oct. 1806 October

Tuesday 14 am at 11 waited upon the Lt. Govnr 5 pm all the Civil
C.S. and Military officers dind with Mr. Bowden. This eve at
Dunbar ½ past 5 Sargt MaCaulay was fird at by some of the
prisoners as he was going his rounds as Sargt of the
Patrole

Wed. 15 am at home all the day
C.S.
Dunmon

Thursday 16 am at home all the day preparing letters for England
C.S.
Durham

Friday 17 am this morn the Govnr sent for me upon Magistrate
C.S. business and engaged till 11 to 2 pm calld upon Capt
Edgeware Johnson

Saturday 18 am at 12 waited upon the Govnr with my letters who took
C.S. them with his Govmt Dispatches
Selkirk

Sunday 19 am ½ past 6 saild the King George Mr Moody the day
C.S. exceedingly Hot blowing hard from the North a very hot
King George wind at 7 pm Lightning and at 9 Rain

October 1806

Monday 20 am this morn the investment that come from England was
C.S. disposed of at Mr. Fosbrooks at 12 went to the Island for
Egham some Spirits 15 Gallons of Rum afterwards out afishing
no Success. In the eve at ½ past 9 Lightning

Tuesday 21 am at 4 the Men came and drew the Seine opposite my
C.S. House and caught a great many fish at 8 blowin very
Nelson fresh from the North. Engagd upon business this day
Twelve Months the ever memorable Battle of Trafalgar
was fought. at ½ past 9 a Signal was made that a strange
sail was in the River. in the Eve Lightning

Wed. 22 am at 4 the Pilot boat went down the River and came up
C.S. at 9. 11 the ship Ferret Letter of Marque a Whaler
Skelton blonging to the House of Bennet and Co. London com-
manded by Capt Phillip Skelton anchord in the Bay she
left England on the 3rd of June 1806 and stopd only at
St. Jago Praye Bay

Thursday 23 am the Morn cold at 12 waited upon the Lt Govnr
C.S.
Egham

October 1806

Friday 24 am at home all the Day at 8 pm I waited upon the Lt
C.S. Govnr and gave him the information of Thos Jones a con-
Exeter vict having killd a cow at 9 we took the Man and confind
him in the Guard House

Saturday 25 am at home all the morn
C.S.
Exmouth

Sunday 26 am at home all the day I gave 3 shillins and 6 pence
C.S. for a peice of Mutton
Proclamation

Monday 27 am at 11 Engaged upon business on the Bench
C.S.
Fareham

Tuesday 28 am the distress of the Colony beyond conception meat 3s/6d a lb Coarse meal 9s and potatoes 1s/6d a lb Indian
C.S. Corn 7s/- a lb and very bad and a very little to be
Furnham obtaind. no work to be done the poor people go out afishing &c

Wednesday 29 am at 6 I went in my Boat down to Browns River afishing
C.S. and took my Gun Killd 4 Ducks returnd at 6 pm to Dinner
Flint My Pigeons dying for want of Provision and Poultry, finishd every grain of corn &c for my Pigeons,

Nettle pup'd

October 1806

Thursday 30 am at home all the morn 5 pm I dind with Capt Johnson,
C.S. and met Lt. Lord and Breeden, Mr. Bowden
Forfar

Friday 31 am at 11 I went out afishing 5 pm Capt. Johnson Lt. Lord
C.S. & Breeden

[Here the remainder for this day is cut from the original Diary]

Saturday 1 am at 11 I waited upon the Govnr 12 went to Captain
C.S. Johnson's when we took a walk. At 6 pm the Govnr
Duckworth punishd 6 Men from the ship Ferret with 100 lashes each because they refusd to let 2 casks of Biscuit and 3 of Flower land for the relief of the Colony. in the Eve I calld upon Mr. Groves.

Sunday 2 am at home all the day. this day I had some strawberrys
C.S. out of my Garden and likewise Green Peas
Glasgow

Monday 3 am in the Morn waited upon the Govnr and sat upon
C.S. business afterwards
Glociester

November 1806

Tuesday 4 am at 11 waited upon the Lt Govnr, afterwards took a
C.S. walk with my Gun. Mr. Bate calld upon me upon business
Greenwich at 3 pm a little Rain. 4 Conolly brought me a little Black cat. this day we had 2 lbs of Biscuit and 1 lb of Flower a week each man a very great relief to the Colony

[Here one day is cut from the original Diary]
[See also Friday 31st October]

Thursday 6 am at 12 I waited upon the Lt. Govnr upon business the
C.S. weather very dry for want of Rain
Gravesend

Friday 7 am upon business all the morning afterwards took a
C.S. walk with my Gun but did not see any Pigeons
Guildford

Saturday 8 am at 11 the Govnr sent for me upon business afterwards
C.S. came home and went out with my Gun did not get a shott
Hadleigh the weather very dry. Nothing grows for want of Rain

November 1806

Sunday 9 am at home all the morning. 3 pm calld upon Capt.
C.S. Johnson at 4 dind with His Honor the Govnr 8 some
London rain This day veal was dressd at the Govnr Table bought
of Capt Johnson

Monday 10 am at home all the morning
C.S.
Halifax

Tuesday 11 am at Court all the morning afterwards went up the
C.S. River in my boat and landed oposite Risdon and walkd
Halstead home kill one Pigeon

Wednesd. 12 am at 6 I got into MaCauleys Boat with 4 men and went
C.S. into Ralphs Bay after ducks had very bad success returnd
Hammersmith home at 5 pm

Thursday 13 am at 11 waited upon his Honor the Lt Govnr. 2 pm went
C.S. out afishing anchord in the Bay the Ferret whaler from a
Hampton Cruse, she did not kill any whales. Rain very much wanted.

Friday 14 am engaged upon the Bench all this morn. After 10
C.S. Prior to that I sent for Warriner, about his misconduct.
Harewood

Hobert Town November 1806

Saturday 15 am at 11 I went out afishing the day very hot, caught
C.S. some very fine Perch the ground very much in want of
Harlow Rain and the grubbs destroy all our vegitables

Sunday 16 am at 11 waited upon the Govnr. at home all the day
C.S.
Harrow

Monday 17 am Since this day 12 months we have had only one Burial
C.S. and that an infant 3 days old. the day very hot. Ther-
Hartland momiter at 12, 78 4 pm 98½ . this morn Early my men
went down the River in Mr. Groves Boat and his 2 Men

Tuesday 18 am Early this Morn we had a very fine Shower of Rain
C.S. at 9 the earth very much refreshd with it. 3 pm very
Harwich fine Moderate Rain, we may truly bless God for the Rain,
which has destroyd Thousands of Grubbs all our Gardens
and the Corn was very much destroyd by them at home
all the day Sowing Seeds and planting in the Garden

Wednesday 19 am very fine rain this morn at 11 I walkd out with my
C.S. Gun to kill a Pigeon could not see any at 2 rainy wr.
Hastings 4 pm do wr.

Hobert Town November 1806

Thursday 20 am the Morn dark and Cloudy with showers at ½ past 10
C.S. went upon the Parade, took a walk with the Govnr, and
Havant returnd to his House at 12 . 1 pm took my boat and went
afishing caught some, and a very large shark. the Gardens
and everything very greatly refreshd after the delightful
Rain

Friday 21 am this morn engaged upon the Bench afterwards came
C.S. home and busey in my Garden many very fine Strawberrys
Hay ripe and Green Peas—

Saturday 22 am at home all the day
C.S.
Helstane

Sunday 23 am the morning very hot 1 pm Capt Johnson and Lieut
C.S. Breedon took a Sandwich with me 4 pm do. wr.
Henley

Monday 24 am at 9 I went down the River into Ralphs Bay and see
C.S. the Try Works with Mr. Groves at 2 came to Sandy bay
Hertford caught some fish and dressd it, the wind very strong from
the South

Tuesday 25 am this morn blowing fresh from the South
C.S.
Highgate

Wed. 26 am this morn we had a very fine shower of Rain, at 12
C.S. Do. wr. which continued all the aft till 5 pm ½ past 5
Hindon Capt Johnson Lt. Lord and Breedon Mr Janson and self
dind with the Govnr

Thursday 27 am this morn Early My Two men that were absent since
C.S. Monday senight returnd they first went to N.W. Port
Hinkley in Storm Bay Passage where they had bad success from
thence they went into Frederick Henry Bay there they had
good success, but the natives took from them 9 Kangarros
while they were hunting and their Boat which they found

again in 3 days search. at 12 went out in my Boat killd a couple of Ducks returnd home at 6 pm to dinner. this Eve Hunter Roberts and Story three Prisoners which have been absent in the woods for 5 months came and surrenderd themselves up to the Night Watch

November 1806

C.S. Hithe Friday — 28 — am the morning wet at 11 sat upon the Bench trying several of the Prisoners the aft very Stormy with Rain wind blowing very hard from the West.

Saturday C.S. Hockliffe — 29 — am at 8 got into the Boat went across the River sent 2 men out akangarroing Self and Earl took guns and went after some ducks at a Lagoon I see three Snipes and had the good luck to kill 2. the first On my return home I gave them to the Governor who wrote me the following Note.

Dear Sir,

I feel much obliged for your handsome Present of what I did not know we had in this Country and which I with Pleasure accept as a very great treat.

Yours truly
David Collins

29th Nov. 1806
Revd R. Knopwood

The first Snipes killd in this country

Earl killd a couple of Teal

Sunday C.S. Hockley — 30 — am the morn very cold and blowing exceeding hard Squalls from the W.N.W. this morn calld upon His Honor the Lt Govnr blowing hard all the day

Monday

December 1806

Monday C.S. Holt — 1 — am at 9 Sat upon business 11 took my Boat and went across the River with my man Gains and Richardson who informd me that, Fossett had taken away my Bitch Miss while they were asleep and had taken all their pork and an Iron Kettle, very bad success in shooting and fishing

on Saturday

Tuesday C.S. Holiwell — 2 — am at home all the Day sent Gains Moffat Richardson in search after my Bitch Miss

Wed. C.S. Hornby — 3 — am this morn the Govnr sent for me upon business. At 12 calld on business upon Capt. Skelton all home the remainder of the day

Thursday C.S. Horndean — 4 — Upon business Trying Capt Skeltons Steward who had robbd him of many things. this aft shot a couple of Pigeons.

Friday 5 am at Court all the morn till late, the day remarkably
C.S. cold blowing very hard from the West, at 5 pm snow
Hornsey upon the mountain at 9 Lightning from the East

December 1806

Saturday 6 am at home all the day none of my men returnd from
C.S. looking after my Bitch Miss which was stole from them
Hull on Saturday 29 Nov. by Fossett one of the Bush rangers.
this day Capt Skeltons Steward was punished for neglecting
his Master and taking property belonging to the Ship
Owners and making away with Biscuit Tea &c &c

Sunday 7 The Morn very cold at 10 Rain. 11 performd Divine
C.S. Service attended by His Honor the Lt Govnr &c &c. at
Huntingdon home all the day

Monday 8 am at 11 My Men returnd from the Coal River where they
C.S. had been out after Fawcett who stole my bitch Miss
Ilford on the 29 or 30 of November went out afishing but caught
Nihil in the morn Early I sat upon the Bench to try
some Prisoners

Tuesday 9 am at home all the day employd in my Garden
C.S.
Ipswich

Wed. 10 am this morning Early I went down to Browns River
C.S. Killd 3 ducks and caught some fish returnd home to dinner
Eclipse at 7 pm the Eclips very visible and spoke of in Moors
Almanack

December 1806

Wed. 10

Thursday 11 At 6 this morn I got into my boat and went down the
C.S. River afishing had very good success the wind blowing
Islington fresh from the S.W. at 11 the wind chang to the South
a Sea Breeze observd many native fires, and the Natives
ahunting dressd some fish in woods. at 4 pm made sail
with a very strong Breeze at South and got home in an
hour and a Quater distance 11 Miles. this day I had
some very fine Beans out of my Garden the first I dressd.
last year I was obliged to preserve all the seed of the
Beans. they do not produce good crops in general.

Friday 12 At 7 sent down the Boat to get some fish and Whale for
C.S. the Dogs. this morn was detaind upon business no intel-
IxWorth ligence of My Bitch Miss the Mountain was coverd with
snow blowing very fresh from the S.W. this Eve I drew
Capt Johnsons seine—very bad success

December 1806

Saturday 13 At home all the day it was cold
C.S.
Kelso

Sunday 14 Early this morn being unwell I had occasion to go into
C.S. the Garden where I see a Man very busy in diging up my
Kendal potatoes, and went to him and found it was my Gardner
Earl, stealing some at 11 performd Divine Service the
Lt. Gov being unwell he did not attend. before the great
scarcity of Grain and other Provision I had 8 pair of
Pigeon and have now only 2 pair left the Lt Govnr at
this time supplies me with a little hemp seed for them,
if not they would have been all dead

Monday 15 Upon business all the morning 2 pm we had a very fine
C.S. shower of Rain which continued some time this morn Early
Kilburn Gains and Richardson went in search of My Bitch Miss
with Mr. Bowden Men who has a Dog taken from him by
the bush Rangers, I took Earl before the Govnr and I
forgave him

Tuesday 16 At 11 this morn I went to the Farm and calld upon hays
C.S. the Settler who informd me that Capt Skelton had pro-
Kingston mised her 6 Gallons of Spirits and a Dozen of wine in the
aft sowd seeds after the Rain.

Wed. 17 in the morn calld upon Capt. Johnson afterwards at home
C.S. in my Garden. 4 pm while at dinner Mr. Williams the
Kirkby Settler brought my bitch Miss she came to him while he
was at Dinner to his Farm

December 1806

Thursday 18 am at 9 Mr Williams the Settler calld and I paid him 10£
C.S. the reward I offerd for any one that would bring my bitch
Kirkham to me at home all the day

Friday 19 am this morn engaged upon the bench and I had the
C.S. following Prisoners to try myself being the only acting
Kneetsford Magistrate in the Colony at 11 Capt Johnson Lieut Lord
Lieut Breedon Mr. Bowden Surgeon attended at the Court.

	Lashes	
absent 8 weeks	300	Tho Tooms for absenting himself from Labour and Dog Stealing
„ 5 „	200	Burchall do.
„ 3 „	100	Plunkett do.
„ 11 „	300	Duff do.
	100	Crener for Robbing Kennedy's Garden after the Court I took a walk with the Govnr at 2 pm Capt Johnson Mr Bowden calld upon me

Saturday C.S. Lancaster — 20 At 11 I went out afishing had very bad success the day cold & my man Earl killd me a couple of Ducks and a Pigeon the wind blowing hard from the West at 11 the punishment of the Prisoners took place

Sunday C.S. Langley — 21 am at 11 performd Devine Service attended by the Lt Govnr &c &c a strong west wind all the Day

the Longest Day

Monday C.S. Longford — 22 at 11 I went out afishing and caught some flat Heads the wind blowing a strong Sea Breeze. came home to dinner at 5 pm at 6 went out again in the Bay opposite my House and caught some Rock Codd and a large Barracoote measured 4 feet 2 inches long and weight 6 lbs ½

Tuesday C.S. Lavington — 23 At 11 the Govnr sent for me upon business he went to the Farm to Dinner the day very warm in the aft I went out afishing very bad success
the country on fire all by Risdon for miles by the Natives

Wed. C.S. Leeds — 24 am the day remarkably hot blowing fresh from the N.W. at 1 pm waited upon the Govnr. Thomas Salmon came in from the Bush Henry Hakin returnd from the Houin with 100 Swans which were deliverd to the Prisoners, in the Eve calld upon McCauley Xms Eve the day very hot at ½ past 3 pm the Thermomiter was 102.

Thursday C.S. Ætna — 25 am at 11 performd Divine service and attended by the Lt Govnr Military and Civil officers &c &c the day was very hot at 3 pm the thermomiter stood at 105 in the shade the heat was so great that it bent the Glass of the thermomiter and broke it. 4 pm I dind with the Govnr off Roast Beef &c the first that was killd for the officers on Xms Day

Xmas Day

December 1806

Friday C.S. Leicester — 26 the morning very hot at 12 waited upon the Lt Govnr— the Country all on fire at 2 calld upon Capt Johnson

Saturday C.S. Lincoln — 27 the morning much cooler at 1 pm I went up in my boat with my men to the farm. They went aKangarroing the Country all on fire up to Herdsman Cove and likewise on this side of the River

Sunday C.S. Liphook — 28 The morning very warm at 11 performd Divine Service taken unwell when at Lt. Lords at dinner this day was obligd to come home soon with a bad pain of my side Mr Bowden attended me

Monday 29 very unwell all the day in the Eve was obligd to have a
C.S. Blister applied to my side the Lt Govnr sent a letter to
Liverpool me to know how I was Mr. Bowden attended me Lt. Lord
calld upon me

Tuesday 30 very ill all the day the Lt. Govnr sent his man to know
C.S. how I was Mr Bowden attended me Lt. Lord calld upon me
Llandford the wind blowing very hard from the W.N.W.

Wed. 31 At 11 Mr Bowden calld upon me this morn much better,
C.S. the Lt. Govnr man came and requested to know if there
Lodden was anything at Govmt House that I wanted in the aft
much better, at 7 pm the Country very much on fire to the
Westward and it approach up the mountain much the Eve
dark and cold.

[The second half of this diary will be published in next year's volume.]

The Royal Society of Tasmania

1946

Patron:

His Majesty the King.

President:

His Excellency Admiral Sir Hugh Binney, K.C.B., D.S.O.

Vice-Presidents:

L. Cerutty, B.A., Dip.Ed., 1947.
W. H. Hudspeth, B.A., 1947, 1948.

Council:

S. W. Carey, D.Sc., 1947, 1948, 1949
W L. Crowther, D.S.O., M.B., 1947.
V. V. Hickman, B.A., D.Sc., 1947, 1948.
L. W. Miller, M.Agr.Sc., F.R.E.S., 1947, 1948, 1949.
J. L. Somerville, M.Sc., F.A.C.I, 1947, 1948
J. W. C. Wyett, B.Sc., A.A.C.I., 1947.

Hon. Secretary and Librarian:

Joseph Pearson, D.Sc. (Manchester), D.Sc. (Liverpool), F.R.S.E., F.L.S.

Assistant Hon. Secretary:

D. C. Pearse, M.C.

Hon. Treasurer:

S. Angel.

Hon. Auditor:

H. J. Exley, M.A.

Hon. Editors of the Papers and Proceedings:

Joseph Pearson.
D. C. Pearse.

Standing Committee:

W. L. Crowther, V. V. Hickman, W. H. Hudspeth, J. Pearson.

Annual Report, 1946

The Annual Meeting was held in the Society's Room, Tasmanian Museum and Art Gallery, Hobart, on the 5th March, 1946.

His Excellency, Sir Hugh Binney, attended for the first time as President of the Society. Prior to the meeting a deputation of the Society, consisting of the two Vice-Presidents and the Honorary Secretary, waited upon the Governor at Government House and asked him whether he would be so good as to accept the presidency of the Society, to which His Excellency agreed.

The following Office-bearers were elected:—

Vice-President: Under the Society's Rules, Professor V. V. Hickman retired from the office of Vice-President, and Mr. L. Cerutty was appointed in his place (retiring 1948).

Hon. Secretary and Librarian: Dr. Joseph Pearson.

Hon. Assistant Secretary: Mr. D. C. Pearse.

Hon. Treasurer: Mr. S. Angel.

Hon. Auditor: Mr. E. J. Exley.

Council: Under the Rules Dr. J. B. Hamilton and Mr. G. C. Israel retired from the Council and the following members were elected to the Council in their places:—

Professor V. V. Hickman (retiring 1949).
Mr. W. H. Hudspeth (retiring 1949).

Also one member was required to take the place of Mr. L. Cerutty, who was elected Vice-President, and Dr. H. D. Gordon was elected for two years. The names of the full Council for 1946 are given on the previous page.

The Council made the following appointments at its first meeting:—

Assistant Librarian: Miss H. Taylor.
Standing Committee: Mr. H. Allport, Dr. W. L. Crowther, Professor V. V. Hickman, and the Hon. Secretary.

The Council elected the following two members of the Society to serve on the Board of Trustees of the Tasmanian Museum and Botanical Gardens:—Professor V. V. Hickman and Dr. H. D. Gordon.

Nine ordinary meetings and one special meeting were held during the year (see Proceedings for abstracts of papers). In addition, scientific papers were submitted for publication and have been printed in the 1946 (present) volume.

Library

During the year 326 volumes were added to the Library in addition to a number of reports and pamphlets from British and foreign institutions and learned societies. The number of institutions on the Exchange List for the year was 284, and new exchanges were arranged with the following institutions:—Royal Museum of Art and History, Brussels; Service de Documentation, Centre National de la Recherche Scientifique, Paris; and Botanical Institute of the Academy of Sciences, Erevan, Moscow. The Library now consists of 21,385 volumes.

An amount of £57 3s. 3d. was spent on books during the year, and the account allocated as follows:—

	£	s.	d.
General Fund	16	13	0
R. M. Johnston Memorial Fund	16	0	2
Morton Allport Bequest	7	10	0
Clive Lord Memorial Fund	15	12	7
A. H. Clarke Bequest	1	7	6

Clive Lord Memorial Library

Reference has already been made to a valuable gift of 230 books presented to the Library by Mrs. Lord in memory of her late husband, Mr. Clive Lord (see 1944 volume, p. 118). During the year under review, the Council decided that a special Clive Lord Memorial Book Plate should be placed in these books, and this has now been done.

Shelves

During the year the Council purchased new bookshelves to meet the growing demands of the Library. These were provided at a cost of £97 11s. from the Reserve Fund, and have been placed at the Macquarie Street end of the Library.

Membership

The Society consists of the following members:—		1945		1946
Honorary members		2		2
Corresponding members		2		2
Ordinary members—				
Class A.	164		173	
Class B.	100		114	
Unclassified	14		7	
		278		294
Life members		9		14
Associate members		14		18
		305		330

During the year 12 names were removed from the list of Members owing to deaths, resignations, etc., and 37 new members were elected, five of these being life members, 27 ordinary members, and five associate members.

Deaths

The Council regrets having to record the deaths of the following members during the year:—Miss D. Baudinet (1929), Miss I. Gunn (1928), and Mr. C. E. Boyes (1944).

Mr. Boyes was the grandson of Mr. G. T. W. Boyes, Colonial Secretary during the Franklin regime. The late Mr. Boyes was a valued supporter of the Society and from time to time presented documents of considerable historic value. Particular mention should be made of the valuable gift of the diary of his grandfather comprising 13 volumes covering the period 1832-1855 (see Papers and Proceedings, 1944, p. 118). These diaries have been studied by Mr. W. H. Hudspeth and have provided him with material for a lecture which was given before the Northern Branch of the Society on 8th October, 1946. This lecture is printed in the present volume (see page 35).

Alteration of Rules

A special meeting of the Society was called on 2nd April, 1946, in order to consider certain alterations to the Rules. Details regarding these alterations are given in the Abstract of Proceedings (see page 131).

Panel Heating

During the year a new system of panel heating was installed in the Society's Room. This was provided at a cost of £206 and was used only during the latter part of the year. The new system promises to solve satisfactorily the difficult problem of heating the room during the winter months.

Meteorological Books

A number of meteorological journals and publications were presented by the Council to the Commonwealth Meteorological Department, Hobart, during the year.

R. M. Johnston Memorial Lecture

During the year the Council decided to have an R. M. Johnston Memorial Lecture. This was held on 5th November, 1946, and Professor L. H. Martin, of the University of Melbourne, was invited to address the Society on the subject of 'Radar'. (See abstract on p. 137.) On that occasion Professor Martin was presented with the R. M. Johnston Memorial Medal. At the conclusion of the meeting Dr. and Mrs. W. L. Crowther entertained members of the Council and their wives, together with the visiting lecturer, to supper at their home.

Preservation of Ancient Buildings and Scenic Reserves

During the year the sub-committee appointed by the Council of the Society continued to function, and met on several occasions. It is the intention of the Council to ask the Minister for Lands and Works to receive a further deputation in order to discuss this subject.

Meeting of Australian and New Zealand Association for the Advancement of Science

A meeting of the Australian and New Zealand Association for the Advancement of Science was held in Adelaide this year after a lapse of seven and a half years. Professor A. Burn, Dr. H. D. Gordon, and the Hon. Secretary (Dr. Joseph Pearson) represented the Society. Dr. Pearson was President of Section D (Zoology) of the Association and the subject of his presidential address was 'some Problems in Marsupial Phylogeny'.

Printing of Index to Papers and Proceedings

The attention of members is drawn to the inclusion in the present number of the second and concluding part of the Index of the Papers and Proceedings for the years 1898-1944 inclusive. The first part of this index was printed in the Papers and Proceedings for 1945.

Gifts to the Society

The following is a list of gifts to the Society during the present year, in addition to the numerous exchanges received from British and foreign institutions:—

Then and Now in Old Westbury, by K. R. von Stieglitz: Presented by the Author.

Letters of Queen Victoria, Vols. 1-3 (1837-61): Presented by Mr. J. D. McElroy.

The Aryan Maori, by Edward Tregear: Presented by Mr. J. D. McElroy.

New Zealand of To-day, by Edward Wakefield: Presented by Mr. J. D. McElroy.

Dictionary of the New Zealand Language, by Wm. Williams: Presented by Mr. J. D. McElroy.

Typee: A Peep at Polynesian Life, by Herman Williams: Presented by Mr. J. D. McElroy.

Polynesian Mythology and Ancient Traditional History, by Sir George Gray: Presented by Mr. J. D. McElroy.

Photographs of Tasmania, by J. W. Beattie: Presented by Miss V. Hunt.

Share Register and Directors' Minute Books, Turkish Bath Coy., 1863-1892: Presented by Mr. G. A. Roberts.

Addresses to H.E. Sir John Stokell Dodds from the Museum and Royal Society, 1901: Presented by Mr. J. D. A. Collier.

List of Relics of Capt. James Kelly housed in the Queen Victoria Museum, Launceston: Presented by Mr. H. W. Wilson.

Document appointing G. T. W. Boyes Colonial Secy., V.D.L., 1842: Presented by Mr. C. E. Boyes.

Various letters from G. T. W. Boyes to his wife, Mary Boyes, 1820-1832: Presented by Mr. C. E. Boyes.

Copy of Franklin Letters to Dr. Turnbull, 1845: Presented by Dr. C. Craig.

Copy of Arthur Letters to Dr. Turnbull, 1839: Presented by Dr. C. Craig.

Milligan Bequest

During the year the Society sold a one-acre block of land at Bicheno which had been left to the Society by Joseph Milligan, a former Secretary of the Society, in his will dated 3rd November, 1883. The block was sold for £150 and this sum has been used to purchase Commonwealth Bonds to that value.

There still remains of this bequest three acres of land at Georgetown, and this is still held by the Society.

Printing of Papers and Proceedings

Once again the Government has very generously contributed a sum of £200 towards the printing of the Papers and Proceedings. The Council wishes to record its appreciation of this assistance.

THE ROYAL SOCIETY OF TASMANIA.

GENERAL FUND.

Statement of Receipts and Payments for year ending 31st December, 1946.

RECEIPTS.				£	s.	d.
Balance from last Account				27	9	6
Membership Fees—						
A	172 =	258	9 6			
B	107 =	112	7 0			
Associate	17 =	8	10 0			
Life Members	6 =	90	0 0			
				469	6	6
Rental, sales, &c.				62	19	9
Sale of land at Bicheno, Milligan Bequest				146	17	4
Transferred from Memorial Funds for books—						
1945—						
R. M. Johnston Memorial		17	5 7			
Morton Allport Fund		3	5 0			
A. H. Clarke Bequest		0	18 11			
Clive Lord Memorial		4	10 0			
				25	19	6
1946—						
R. M. Johnston Memorial		16	0 2			
Morton Allport Fund		7	10 0			
A. H. Clarke Bequest		1	7 6			
Clive Lord Memorial		15	12 7			
				40	10	3
				£773	2	9

PAYMENTS.				£	s.	d.
Salaries				156	17	0
Group Insurance				2	4	0
Petty Cash				40	1	0
Fuel and Light				24	0	5
Library				80	9	6
R. M. Johnston Memorial Lecture, expenses				11	0	0
Miscellaneous				80	12	8
Postage of Papers and Proceedings				27	7	10
Stationery, Printing and Advertising				34	9	8
Insurance				9	12	7
Northern Branch, share subscriptions				10	13	0
Milligan Bequest (Commonwealth Loan)				150	0	0
Reserve Fund—						
Six Life Memberships	90	0	0			
Transferred from General Fund	50	0	0			
				140	0	0
				767	7	8
Balance to next Account				5	15	1
				£773	2	9

S. ANGEL, Hon. Treasurer.
H. J. EXLEY, Hon. Auditor.

HENRY ALLPORT, Vice-President.
JOSEPH PEARSON, Hon. Secretary.

Balances in Royal Society Funds, 1946.

	£	s.	d.
Reserve Fund	122	4	4
Life Membership Fees	163	15	6
Clive Lord Memorial Fund (£200)	29	1	8
R. M. Johnston Memorial Fund (£232)	2	0	6
Morton Allport Memorial Fund (£200)	0	10	0
A. H. Clarke Bequest (£100)	2	3	10
Milligan Bequest (£150)	Nil		

Abstracts of Proceedings

5TH MARCH, 1946

Annual Meeting

The Annual Meeting was held in the Society's Room, Tasmanian Museum. Professor V. V. Hickman, Vice-President, presided.

The following were elected Office-bearers and members of the Council for 1946:— Mr. L. Cerutty was elected Vice-President in the place of Professor V. V. Hickman, who retires under Rule 12; Professor V. V. Hickman and Mr. W. H. Hudspeth were elected in the places of Dr. J. B. Hamilton and Mr. G. C. Israel, who retire under Rule 21; Dr. H. D. Gordon was elected to take the place of Mr. L. Cerutty, who was elected Vice-President; Hon. Treasurer, Mr. S. Angel; Hon. Auditor, Mr. H. J. Exley; Hon. Secretary, Dr. J. Pearson; Assistant Hon. Secretary, Mr. D. C. Pearse.

Mr. M. Bower was elected a member of the Society.

Mr. W. H. Hudspeth delivered an illustrated lecture entitled 'The Stones of Hobart'.

2ND APRIL, 1946

A special meeting was held in the Society's Room. Mr. Henry Allport, Vice-President, presided.

Rule 44 was amended to read as follows:—

> Ordinary and life members shall have the right to vote for Office-bearers and Council, to attend all meetings of the Society, and to take part, subject to the control of the Chairman of such meeting, in the business of such meetings, to use the Library and books of the Society, subject to any rules which the Council may make regulating the Library and its use. Each Ordinary Member who, under Rule 33, is entitled to receive the Papers and Proceedings, shall receive one copy for every year during which his subscription has been duly paid.

The following new rules were passed:—

> 1. That all papers published in the Society's Papers and Proceedings should be deemed to be the property of the Society.
> 2. That in the case of all papers read before the Society but not printed in the Papers and Proceedings a copy of the manuscript should be placed in the Society's Library for permanent record.

2ND APRIL, 1946

A meeting was held in the Society's Room. Mr. Henry Allport, Vice-President presided.

The following were elected members of the Society:—Ordinary Members: Miss Joi Chapman, The Lord Bishop of Tasmania, Mr. J. C. Bennett, Mr. H. A. Buchdahl, Mr. D. A. Davie, Dr. R. W. Lawrence, Mr. W. N. Oats; Associate Member: Mr. W. B. Hitchcock.

Mr. L. W. Miller delivered an illustrated lecture entitled 'The Nutritional Requirements of Insects', of which the following is an abstract:—

Until recently the subject of insect nutrition had been a neglected branch of the science of entomology. The recent war and the importance of food storage necessitated intensive studies being made into the food habits and nutritional requirements of many of the pests of stored foods.

Because of the wide diversity of foods that are eaten by insects, one finds a high degree of specialisation in the food habits of the various species. Research has shown, however, that despite this superficial complexity, the fundamental nutritional requirements of the various species are surprisingly uniform. They may, however, be satisfied in different ways from widely differing sources.

Insects, like other living organisms, must somehow obtain energy, carbon and nitrogen, and the mineral elements necessary for the functioning of protoplasm. The sources of carbon and nitrogen must be as organic compounds as insects are quite incapable of satisfying their nutritional requirements with simple inorganic salts.

The importance of fats and the various mineral elements in insect nutrition is still imperfectly understood. In recent years it has been shown that vitamins are also essential in insect nutrition. The present knowledge of the vitamin requirements of insects suggests that they require only members of the "B Group" vitamins. Sometimes, however, the vitamin requirements of the insect may be satisfied by intra-cellular symbionts, which apparently have the power of synthesising some or all of the "B Group" vitamins.

7TH MAY, 1946

A meeting was held in the Society's Room. Mr. Henry Allport, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Mrs. E. M. Cuthbert, Miss Katie Helms, Mrs. A. N. Lewis, Dr. Thomas Giblin, Mr. J. N. D. Harrison, Mr. M. L. Hughes, Mr. N. R. Laird, Major J. W. C. Wyett; Associate Members: Miss Margaret Hope, Mr. E. R. Taylor, Mr. Bernard B. Walker.

A paper entitled 'The Military History of Tasmania', prepared by Brigadier O. V. Hoad, was read by Mr. W. H. Hudspeth. The following is an abstract:—

Tasmania has associations with the British Army dating back for 142 years.

The army played an important part in building up the British Empire and a number of Imperial regiments served in Tasmania and other parts of Australasia.

Lt. John Hayes of the Royal Indian Navy brought an expedition to Tasmanian waters in April 1793, when he named the River Derwent and also gave the name Risdon to the place where the first settlement was established. Lt. John Bowen, R.N., arrived at Risdon on 12th September, 1803, to form the first settlement there. Lt. Colonel David Collins landed at Risdon on 16th February, 1804 and was received by a Guard of Honour formed by members of the New South Wales Corps under Lt. Moore, who was acting Commandant at the time, Lt. Bowden having gone to report to the Governor in Sydney. Lt. Edward Lord, R.M., built the first private house on or near the site where Macquarie House now stands in Macquarie St.

In July 1804, the military garrison consisted of a Lt. Colonel, two first lieutenants, one second lieutenant, three sergeants, three corporals, two drummers and 37 privates. The first garrison in Northern Tasmania consisted of a detachment of the New South Wales Corps under Lt. Colonel William Paterson; they arrived at the Outer Cove near George Town in November 1804. Until 1812 this northern settlement and that at Hobart Town were administered as separate commands, each having a Lieut. Governor, who was also the senior military officer. An interesting fact relating to Lt. Colonel Collins' garrison is that it was responsible for the first wedding in Tasmania. This was the wedding of Corporal W. Gengell and Mrs. Anne Skilhorne, a widow at Government House, on 18th March, 1804.

The duties of the military forces in the early days were many and varied. They had to keep order, protect the inhabitants from aboriginals and bushrangers, hunt down escapees, guard prisoners and supervise road building and other public works. The opening up of new areas brought fresh responsibilities to the army. In 1824 there were 230 troopers in Tasmania, detachments being at George Town, Launceston, Macquarie Harbour, Jericho, New Norfolk, Ross and twenty-five men were held in reserve for the pursuit of bushrangers.

From 1870, when the last British regiment left Tasmania, until Federation, Volunteer regiments constituted the main military forces in the island.

The first Tasmanian contingent to go abroad was one company raised in October, 1899 with a strength of four officers, one W.O., five sergeants, four corporals, two buglers and sixty-four privates. Since then several Tasmanian contingents have seen service overseas, winning for themselves high praise, and many decorations.

A paper entitled ' Huts of Tasmanian Aborigines ', prepared by Mr. J. F. Jones, was read by Mr. A. L. Meston. The following is an abstract:—

On that part of the west coast that lies between Mt. Cameron West and the Pieman River, circular artificial hollows about four feet deep and of varying diameters occur in small groups. Such hollows are found only on well-drained spots from which a good outlook can be obtained, and from the evidence gained by excavating them, they are all that remain of native huts such as were seen and described by Robinson, Jorgensen and others. If one of these circular depressions is dug there is first a foot or so of clean drift sand, then appears a layer of blackened sand mixed with charcoal, shells, bones, native flaked instruments and cores from which the flakes were struck. In addition there are usually a few long fire-blackened stones that evidently enclosed the fire. Lower still the sand again becomes clean and shows no sign of having been previously disturbed.

Of one hut that he saw Jorgensen writes, ' It was a complete piece of Gothic Architecture in the shape of a dome and presenting all the first rudiments of that science. It was made to contain 12 to 14 people with ease. The entrance was small and not above two feet high. The wood used for the principal supports had been steamed and bent by fire.'

When on a visit in 1945 to Bluff Hill Point, in close proximity to the site of the hut praised by Jorgensen, Mr. Jones noticed standing erect at the edge of one of the hut depressions a portion of a rib of a large whale. On pulling it out of the sand, he found it to be but a fragment two feet long, the upper portion from exposure to the air having decayed. The end that had been forced into the ground had been cut to a point on two sides by the chopper of a native. Near by he found a complete rib, from its size apparently of the same whale, but little decayed having probably been only recently uncovered.

Upon reflection he considered that in one at least of the huts a whale's ribs had been used for the supports, and he realised how Jorgensen's Gothic vault and dome were quite comprehensible. A number of ribs with one end buried in the sand at intervals around the hollow, and with their other ends gathered and fastened together over the middle of the hut, would, when completed with lighter material and thatched make a very perfect dome. Inside in the dim light, and blackened by smoke, the bones might easily be mistaken for wood, while their smoothness and the evenness of the curves would give the impression of timber that had been artificially shaped.

Good thatching material exists in the vicinity. Large tufts of coarse tough grass about six feet high with smooth flat blades an inch or more in width are very plentiful in sheltered spots among the bushes which it makes quite impenetrable.

Mr. Meston exhibited some knobbed implements made from trees by the Aborigines and sent by Mr. James, Head Teacher of the Marrawah State School.

4TH JUNE, 1946

A meeting was held in the Society's Room. The President, His Excellency the Governor, presided.

The following were elected members of the Society:—Ordinary Members: Mrs. G. Cox, Mr. R. F. Davidson, Mr. M. C. Neuburger; Associate Member: Miss P. W. Richardson.

Mr. J. M. Gilbert delivered an illustrated lecture entitled ' Forest Fire Control ', of which the following is an abstract:—

Fire damage must be kept to a minimum if forest benefits are to be obtained in full and sustained amounts. Fires affect the growth and composition of stands and in a few cases can be used as a beneficial sylviculturne tool. Indiscriminate burning adversely affects watersheds and wild life.

Fire prevention activities include education, legislation and the removal of hazards. Pre-suppression work includes the erection of look-out towers, the provision of communications, access, transport, equipment and water storage and the training of fire crews.

There are three main principles to be observed in forest fire suppression:—

(1) Make a reconnaisance before the starting.

(2) Tackle the head fire as soon as possible.

(3) When the spread is checked, the fire should be mopped-up and patrolled.

Fire control planning includes investigation of fire causes and classes of people responsible, into the effectiveness of pre-suppression measures and fire-weather forecasting.

An annual suppression plan should be prepared for each district.

The question of the amount that can be afforded for forest fire protection has not been satisfactorily answered.

2ND JULY, 1946

A meeting was held in the Society's Room. Mr. L. Cerutty, Vice-President, presided.

The following were elected members of the Society:—Mrs. G. E. Perrin, Miss Ruth White, Mr. A. M. Olsen.

Dr. J. Pearson exhibited the following:—

(*a*) A sub-fossil tooth of the Sperm Whale *(Physeter catodon)*, from Flinders Island.

(*b*) Osteological remains of the False Killer Whale *(Pseudorca crassidens)*, found near Eddystone Lighthouse.

(*c*) Osteological remains of the Strap-toothed Whale *(Mesoplodon grayi)*, from Eaglehawk Neck.

Mr. G. T. J. Wilson delivered a lecture entitled 'Local Government and Democracy'.

6TH AUGUST, 1946

A meeting was held in the Society's Room. The President, His Excellency the Governor, presided.

Miss Ann Fraser and Mr. A. P. Findlay were elected members of the Society.

Dr. Joseph Pearson delivered an illustrated lecture entitled 'The Evolution of the Mammalian Placenta', of which the following is an abstract:—

The term *placenta* should be applied to those structures which assist in bringing about an intimate apposition or fusion of the trophoblast and associated parts of the foetus with the uterine wall for the purpose of carrying out physiological processes necessary for the well-being of the foetus.

The accompanying figure embodies all embryonic structures which take part in placental formation but which are not necessarily found in the same embryo at the same time.

The following foetal structures may become apposed to the uterine epithelium or uterine wall to form a placenta:—

1. *Chorion* (*Ch.*)

Consists of the extra-embryonic ectoderm or trophoblast (Tr.) and somatic mesoderm (S.M.). This is the simplest type and is non-vascular. The 'uterine milk' is absorbed through it. Probably functions in monotremes and for a short period in marsupials and eutherians. *(Chorionic Placenta.)*

2. *Bilaminar omphalopleure* (Bi. Om.)

Consists of the trophoblast and the yolk-sac endoderm (Ys.E.). Non-vascular. Present in many marsupials throughout the foetal period and probably functions for a brief stage in some eutherians. *(Bilaminar Vitelline Placenta*, or *Non-vascular Yolk-sac Placenta.)*

3. *Vascular omphalopleure* or *chorio-vitelline membrane* (V.Om.)

Consists of trophoblast, somatic mesoderm, splanchnic mesoderm (Sp.M.) and yolk-sac endoderm. Vascular. The functional placenta of most marsupials, and functional for a short time in the early stages of *Perameles* and many eutherians. *(Chorio-vitelline Placenta* or *Vascular Yolk-sac Placenta.)*

4. *Allantochorion* or *Chorio-allantoic membrane* (Al.Ch.)

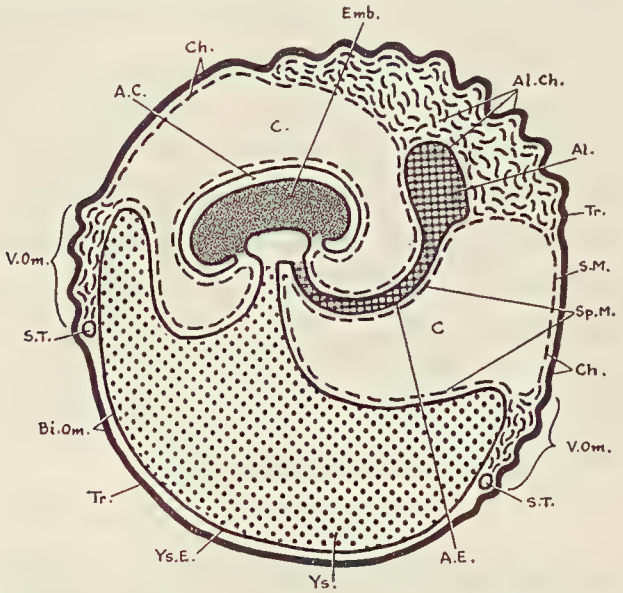
Formed normally when the allantoic endoderm (A.E.) with its investing layer of splanchnic mesoderm reaches the chorion. This is the 'true' or allantoic placenta, characteristic of *Perameles* and all eutherians. *(Chorio-allantoic Placenta.)*

In the most primitive type of chorio-allantoic placenta, the *epitheliochorial*, the two blood streams are separated by six sets of tissues:—

Foetal. Endothelium of the foetal blood vessels, mesoderm, and trophoblast.

Maternal. Uterine epithelium, connective tissue, and endothelium of the maternal blood vessels.

In the more modified types of placenta the trophoblast attacks first the uterine epithelium and later the other two maternal components until in the most highly specialized and efficient type, the *haemoendothelial*, the extravasated maternal blood surrounds the foetal blood vessels so that interchanges between maternal and foetal blood streams are effected across the simple membrane which constitutes the wall of each foetal blood vessel.



Embryonic structures which may contribute to Mammalian Placentation. (The maternal components of the placenta are not shown.)

A.C. amniotic cavity, *A.E.* allantoic endoderm, *Al.* allantois, *Al.Ch.* allanto-chorion, *Bi.Om.* bilaminar omphalopleure, *C.* extra-embryonic coelom (splanchnocoele), *Ch.* chorion, *Emb.* embryo, *S.M.* somatic mesoderm, *Sp.M.* splanchnic mesoderm, *S.T.* sinus terminalis, *Tr.* trophoblast, *V.Om.* vascular omphalopleure, *Ys.* yolk-sac, *Ys.E.* yolk-sac endoderm.

The fundamental embryonic elements in a vascular placenta are (1) the trophoblast with its phagocytic effect upon the uterine tissues and (2) the splanchnic mesoderm which bears the placental bloodvessels of the foetus.

In the Marsupialia the following placental conditions are found:—

Type 1

Allantois does not reach the chorion.

Bilaminar vitelline placenta sometimes functional.

Chorio-vitelline placenta generally well-developed (*Didelphis*, some phalangers, rat-kangaroos and kangaroos).

Type 2

Allantois reaches the chorion but does not form a placenta. Later retreats from the chorion and takes up a position as in Type 1.

Bilaminar vitelline placenta, probably nutritive.

Chorio-vitelline placenta probably respiratory. *(Dasyurus.)*

Type 3

Allantois reaches the chorion and remains there but is not placental, probably respiratory.

Both types of vitelline placenta function, probably nutritive. *(Phascolarctos, Halmaturus.)*

Type 4

Allantois reaches the chorion and forms a functional chorio-allantoic placenta.

Chorio-vitelline placenta functional in early stages. *(Perameles.)*

It is usually considered that Type 4 is the most primitive and that gradual retrogression from a functional chorio-allantoic placenta is shown in Types 3, 2 and 1, with Type 1 exhibiting the greatest degree of degeneration. It is also widely accepted that the common ancestors of the marsupials (Methatheria) and 'placental mammals' (Eutheria) had a chorio-allantoic placenta

and that all marsupials except the perameloids have lost their true placenta and have fallen back upon the inefficient vitelline placenta. One of the purposes of the present lecture was to call in question these accepted views and to show cause why the sequence as given above, with *Perameles* as the last and most specialized of the series, probably depicts more correctly the course of placental evolution in the marsupials.

It was claimed that a good case could be presented for considering the common ancestors of the Metatheria and Eutheria as having lacked a chorio-allantoic placenta, and that the perameloid type of placenta had arisen by convergence. The absence of a chorio-allantoic placenta in nearly all recent marsupials might be due to their having arisen from non-placental stock.

The various types of placentation in eutherian mammals were then considered. It was shown that in the early stages of foetal development of all viviparous mammals the yolk-sac is relatively large and may for some time have placental functions. In marsupials the yolk-sac retains its importance and has placental functions and the allantois is small and usually non-placental. It was suggested, therefore, that the Proplacentalia possessed a vitelline placenta and that when the marsupials and eutherians diverged from this common stock the former retained the ancestral characteristic, while in the latter group the yolk-sac gradually lost its importance and was ultimately superseded as a placental organ by the allantois.

Some investigators claim that the placenta provides a reliable criterion of mammalian inter-relationships, but this view is open to question. It was pointed out that recent researches in reptilian placentation have revealed that in this group at any rate the type of placentation did not necessarily give an indication of affinity.

3rd September, 1946

A meeting was held in the Society's Room. Mr. H. Allport, Vice-President, presided.

The following were elected members of the Society:—Mr. Gollan Lewis, Mr. R. A. McInnes.

The Assistant Honorary Secretary drew the attention of members to the Geographical Journal, Vol. CVI, Nos. 5, 6: Nov.-Dec. 1945, in which there is a paper dealing with the sailing of Sir John Franklin with the 'Erebus' and 'Terror'.

Mr. W. T. Dowsett delivered a lecture entitled '"Ordinary People" in the First Settlements' of which the following is an abstract:—

The purpose of the paper was to demonstrate the use of the atomistic method of historical study as a supplement to the usual approaches through the development of States resting upon Austinian monism or by the pluralist examination of the interplay between movements and institutions. That is to say, the paper was concerned only with the views of historical events seen through the eyes of ordinary people of the times.

Two justifications of the method were given, the first based upon a normative historical philosophy. It suggested that any social science is concerned with the interplay between man and environment, the selected norm being capacity for survival. History regarded thus is concerned with institutional environment and its effects upon man; and since generally speaking, history is made by movements and influenced by great men, but suffered by little men, the little man's reactions to his times are of vital importance.

The method is justified, even for those who do not accept the normative approach, because it can be used to reinforce other studies of positive pluralist history. The source material for research into past movements and associations is largely composed of the writings of those who played leading parts in determining them; it may therefore be coloured by their philosophy. A correction to this is the study of the lives of ordinary people who endured more or less passively the influence of those associations.

One of the few well-known examples of this method is 'Mediaeval People', by the late Professor Eileen Power. The paper presented three similar studies, taken from early Australian history, given principally by the Historical Records of Australia. The life of Edwin Dodd, one-time valet to Phillip and manager of the Parramatta community farm, illustrates conditions during the few years of autocratic communism at the beginning of Port Jackson. Richard Clark, soldier and stonemason, experienced the difficulties of settlement in the first days of Van Diemen's Land. Finally, the story of Edward Eagar, emancipist, casts light not only on the changing balance of social classes in New South Wales during the second decade of the nineteenth century, but also on the rise and growth of such institutions of the growing capitalism in the State as Macquarie's Bank and the forms of internal and foreign trade.

1st October, 1946

A meeting was held in the Society's Room. Mr. H. Allport, Vice-President, presided.

The attention of members was drawn to the new Panel Heating system in the Royal Society's Room.

The following were elected members of the Society:—Mr. R. W. Hortle, Mr. C. W. Kent, Rev. L. O. C. White.

Mr. L. Cerutty delivered a lecture entitled 'Robert Boyle, Chemist, and His Times'.

The Reverend Walter Walters exhibited a book written by Robert Boyle on 'The Usefulness of Natural Philosophy', which has been in the Bothwell Public Library since 1839.

5th November, 1946

A meeting was held in the Society's Room on the occasion of the R. M. Johnston Memorial Lecture. It was advertised as a public meeting and invitations were also extended to members of the member Societies of the Tasmanian Association of Scientific Societies.

Approximately 200 people were present.

Mr. L. Cerutty, Vice-President, presided.

The following were elected members of the Society:—Mr. H. K. Aves, Mr. W. F. Walker, Mr. G. H. Willing.

The following papers which had been submitted for publication in the Society's Journal were tabled, and it was agreed to submit them to the Standing Committee:—

Note on a new Cestode from the Tasmanian 'Electric Ray' (*Narcine tasmaniensis* Richardson). By P. W. Crowcroft. (See page 1.)

Some digenetic Trematodes from Fishes of Shallow Tasmanian Waters. By P. W. Crowcroft. (See page 5.)

The female urogenital system of the Bandicoots *(Peramelidae)*. By Joseph Pearson.

The development of the urogenital system in the Marsupialia. By Joseph Pearson.

The Chairman presented the R. M. Johnston Memorial Medal to Professor L. H. Martin, who then delivered an illustrated lecture on 'Radar', as follows:—

Introduction

Two outstanding contributions were made by the physicists of the United States during the War—*Radar* and the *Atomic Bomb*. It may be that History will confirm the opinion expressed by Professor Blackett that the atomic bomb did little to win the war and has since served only to bedevil the Peace, but of Radar there can be no division of opinion. In its many modifications and adaptations Radar did more than any single technical device to bring defeat to the enemy.

The story of Radar mirrors in a striking fashion the development of the struggle against the forces of Germany by the British Empire. In its original conception as a defensive weapon, it played a decisive part in winning the Battle for Britain. Later, coupled with the mounting air strength of the United Nations it evolved into an offensive weapon which slowly drained the vitality of German industrial power. Radar brought defeat to the U-boat in the Battle for London, and paved the way for success on D-day by assuring precision bombing of German defences through solid overcast. As a measure of the military significance of Radar, it might be mentioned that by July 1945 nearly $3,000,000,000 worth of equipment had been delivered to the U.S. Forces and no doubt a like sum had been expended by Britain.

Basic Principles of Radar

Officially the term Radar is said to derive from the descriptive phrase ' radio-detection and ranging '. This definition omits a third aspect of the technique which is equally important, namely ' direction finding '. In this regard the original British term ' Radiolocation ' was more satisfactory.

The principles upon which Radar operates are not new; they were demonstrated by Hertz in 1886 when he discovered that radio waves possess the optical properties of visible light.

1. *Radio-Detection*

If a beam of radio waves is directed towards a solid body, a small fraction of the energy will be scattered or reflected back towards the transmitter and may be detected with a sensitive radio receiver. Usually the receiver is operated at the limit of its sensitivity; for example, in detecting a medium bomber at 150 miles the power entering the receiver is less than $1/10^{18}$ of the power radiated by the transmitter.

Radio detection is analogous to the detection of a plane with a searchlight but possesses essential advantages. The range of Radar is greater than that of the eye, and its ability to detect the target is relatively unaffected by night, fog, smoke, or rain. One of the most potent factors in warfare is surprise, but the element of surprise formerly afforded by darkness, fog, cloud or artificial smoke or simply the glare of the rising sun does not exist in a Radar war. At one time naval battles were described by the factor of who happened to be ' up-sun ' from the enemy. The successful action at Cape Matapan by the Mediterranean Fleet took place in pitch darkness at ranges so great that the Italian Fleet had no idea that our ships were in the vicinity. The Scharnhorst was crippled by our heavy guns long before she was in sight.

2. *Ranging*

Ranging by radio makes use of the fact that radio waves travel with the velocity of light, 186,000 miles a second. The technique of ' pulse-ranging ' was first used in 1925 by Breit and Tuve of the Carnegie Institute of Washington for measuring the altitude of the ionosphere. A transmitter and receiver are located at the same place, usually sharing a common aerial, and the transmitter is designed to radiate energy in very intense bursts of short duration called ' pulses '. The duration of each pulse may be one-millionth of a second, and each pulse is separated by an interval of a few thousands of a second. During those periods in which the transmitter is silent the receiver detects the echoes of the transmitted pulse scattered back from the target. The time interval between the transmission of a pulse and the reception of its echo is a measure of the distance of the target from the receiver for in this interval the pulse travels with the speed of light to the target and back. Thus if the target is one mile away, the pulse makes the double journey of two miles taking 10·7 microseconds. In spite of the technical difficulties, methods for measuring short intervals of the order of microseconds have been so far improved during the war that the range accuracy in gun laying is now 5 to 10 yards, which corresponds to about 1/30 of a microsecond. Time intervals in Radar are measured with a cathode ray oscillograph. A stream of electrons is made to fall on a screen of fluorescent material such as zinc sulphide and at the point of impact produces a bright spot. This can be swept across the screen with a uniform speed by applying across the X axis plates a uniformly changing potential such as can be obtained by charging or discharging a condenser through a pentode valve. These electrical elements can be chosen to give an appropriate range scale, for example with a long range early-warning Radar the scale may be marked off into divisions of 107 microseconds each of which represents 10 miles of range. For equipment designed to give more accurate ranges at close quarters the scale may be graduated into divisions of 6·1 microseconds, each of which represents 1000 yds of range. The number of journeys of the spot per second is equal to the number of pulses per second and may vary between 100 and 1000. Owing to the persistence of vision the observer sees a bright line on the screen interrupted by a ' blip ' corresponding to the range of the target.

3. *Direction-finding*

In most Radar applications directional antennae are used to determine the azimuth and elevation of the target and to concentrate the energy in the desired direction. Accuracy in direction-finding is determined in large measure by the beam width which is given by the formula

$$W^\circ = 2{\cdot}1 \left(\frac{\lambda \text{ cm}}{D \text{ ft}}\right)$$

where λ is the wavelength of the radio waves and D is the effective width of the antenna. In the early days of the war λ was usually 150 cm. and D of the order of 20 ft., in the closing days, λ was 1·5 cm. and D approximately 2 ft., giving a ten-fold improvement in resolution. It is interesting to compare the performance of sound detectors used in the 1914-18 War and the early days of the last War with direction-finding Radar. Consider an aeroplane 10 miles away which is approaching at 300 miles an hour—it will have travelled 4 miles in the

time taken for the sound to reach the observer. The time taken for a radio pulse to reach the plane and return to the receiver is 107 microseconds—in this time the plane will have moved about one-half of one inch. The advantage of Radar to the anti-aircraft gunner is obvious.

Radar in Operations

During the winter of 1934-35 the British Air Ministry set up a Committee for the Scientific Survey of Air Defence with Sir Henry Tizard as chairman. Sir Robert Watson-Watt, then the head of the National Physical Laboratory Radio Department, suggested the pulse method of Breit and Tuve for the detection of aircraft, and the first experimental system was set up in the late spring of 1935 at Baudsey near the east coast. It is reported that Churchill, on witnessing the first successful tests exclaimed 'England is once again an island'. Work began in 1936 toward setting up five early warning stations about 25 miles apart to protect the Thames estuary. By March 1938 all these stations—the nucleus of the great chain which ultimately stretched along the east coats—were complete and operating under R.A.F. personnel. These early warning sets were mounted on huge masts, and ultimately had a warning range of nearly 200 miles. The structures supporting the aerials afforded an unmistakable target, but in the critical early days for some reason were never attacked by the Germans, neither did they attempt to avoid the radio beam by flying in low. The assaults on England by the Luftwaffe began on 8 August 1940 and were initially directed at R.A.F. and Navy bases, but a month later mass raids on London began. Despite a critical shortage of first line fighter planes and pilots (the number of planes has been given as 500), Radar early warning enabled the British to spot each incoming raid in time to throw fighters against it. Under favourable conditions Radar actually disclosed German planes assembling on the French coast prior to a raid. During August the total loss of German planes was 957 and in the great September battles the Nazis lost nearly 200 of every 500 planes which attacked. By the beginning of November the Germans replaced day raids by night attacks.

The British had foreseen the danger of indiscriminate night raiding and had striven to develop methods to combat them. As far back as 1938 experimental equipment had been developed for use by night fighters to enable them to detect hostile aircraft (Aerial Interception equipment). The night fighters were also given considerable assistance from the ground by S.L.C. ('Elsie', searchlight control) which searched for and found the enemy plane by Radar before the arc was switched on. Experience showed that the target was illuminated 9 times out of 10. In spite of successes a serious situation was not really brought under control until a technique of fighter direction from the ground was built up. This was called G.C.I.—ground controlled interception. A controller on the ground watched the air situation on the screen of a Radar set which could be rotated to cover the visible horizon. He chose a specific target and gave instructions through a V.H.F. communications system to the fighter under his control and manouevred the fighter to a position 1 to 3 miles behind the target, just below and on the same course. He then instructed the fighter to 'flash his weapon' and the A.I. on the plane took over. This was operated by a special Radar operator in the plane who had no other duties than to direct the pilot up to the moment when they were able to see the enemy plane against the night sky. From this time on the pilot completed the attack.

It will be remembered that the width of the Radar searching beam is given by the expression $W = 2{\cdot}1\ (\lambda/D)$. The shortcomings of early airborne sets was due to the fact that with the shortest wavelength available (1·5 m.) and an aerial of the maximum dimensions which could be mounted on a plane the width of the beam was still too great to give precise direction-finding. Accordingly a research group at the University of Birmingham under the direction of Professor Oliphant was given the task of inventing a valve which would generate radio waves some centimetres in length with adequate power. This was achieved by Randall & Boot with their invention of the 'cavity' magnetron, a device which revolutionised the performance of Radar and placed the Radar techniques of the United Nations far ahead of those of the enemy.

Centimetre Radar

One of the first applications of the 10 cm. magnetron was the development by ADRDE at Malvern of an accurate gun laying equipment for anti-aircraft fire. The tiny dipole was mounted at the focus of a 6 ft. paraboloid and this gave a sufficiently narrow beam (4°) to obtain an average accuracy of 6 min. in angle measurements.

The British G.L.III equipment was robust and accurate. In service trials over rough ground the gun carriage of the A.A. gun was cracked but the G.L.III was operating within a few minutes. Radar-controlled A.A. scored its most striking victory against the V1 buzz bombs. There was a great balloon barrage across the Downs which entangled some of the V1's in its web of steel cables. Radar plotted the paths of the bombs and disclosed many of the launching sites to Allied bombers. G.C.I. controlled jet planes also accounted for vast numbers, but it was clear from the first cloudy day that if buzz bombs were to be dealt with it was A.A. fire which would have to solve the problem. This A.A., coupled with the proximity fuse, did in large

measure. On a Sunday late in August 105 V1's crossed the British coast headed for London—only 3 of them arrived. Some teams brought down one buzz bomb for every 40 rounds fired. At the end the A.A. was shooting down the great bulk of the bombs and doing just as well on cloudy as on clear days.

For coastal batteries both 3 and 10 cm. waves have been used. It is possible to follow on the screen the path of the shell on its way to the target and if a miss is scored the correction to aim can be made by observing on the screen the distance between the target and the splash. Similar systems are used on ships for gun laying. Ship defence against air attack is interesting. Radar equipped gun directors are trained on the incoming planes. They feed range, altitude, and bearing, into predictors which take into account the target speed, the ship's motion, &c., and position the guns correctly to hurl their shells into the exact spot where the plane will be when the shells arrive. In this way guns of different calibre form screens at different distances corresponding to their range.

From the beginning of the war, the Germans had decided to put a major effort into the destruction of allied shipping by concentrated U-boat warfare, knowing that a German victory depended ultimately on their achieving control of the seas. More than other phases of the conflict the Battle of the Atlantic was a technical conflict, and it did not look always as if the submarine would be beaten. During 1942 Allied shipping was being sunk at the rate of 16,000 tons a day. There were three basic methods of fighting the U-boats:—

1. To attack by bombing the factories which make submarines and the repair shops which maintain the submarines between voyages. The Germans beat this attack by thick layers of concrete;
2. To watch continually the lanes of egress and the areas of operation of the submarines and to search for surfaced submarines; and
3. By employing the convoy system.

In the last war the submarine proceeded submerged during the day and came to the surface at night to charge its batteries. This was no longer possible with Radar-equipped planes which could detect a surfaced submarine tens of miles away.

The Germans ultimately suspected Radar, and this was confirmed in the spring of 1942 when they captured intact one of the A.S.V. Radar sets used by Coastal Command. The Germans countered by equipping each submarine with a receiver which covered the wavelength range used by the A.S.V. Radar. This receiver gave a signal whenever the beam from the airborne Radar swept over the submarine and sufficiently early to permit the U-boat to submerge and escape attack. By the end of summer it was clear to the Allies what was going on. While the number of visual sightings changed very little, the number of Radar sightings declined steadily and the number of blips which disappeared while the plane approached the target told the story.

The British were ready with their next weapon—centimetre A.S.V. The U-boat activities increased markedly during the winter of 1942-43 but by spring a number of 10 cm. A.S.V. sets were in operational use. During May, June and July of 1943 nearly 100 confirmed submarine kills were made, two-thirds of them by aircraft. The German technicians redesigned their receiver several times, painted the U-boats with a special paint in case the Allies were using infra-red detection devices, but still the losses mounted. Two scientific expeditions put to sea in U-boats fully equipped to search for the mysterious radiation used by Coastal Command to detect submarines. Civilian experts were carried with complete and modern apparatus. The first boat put to sea from St. Nazaire on Feb. 5 1944 and lived 13 days. The second left Lorient on April 27 and lasted 9 days. It was not until autumn of 1944 that the Germans found a counter by installing an air-tube they called Schnorkel which enabled a U-boat to breathe and to run its Diesels while still remaining submerged. An extraordinary aspect of the whole story is that the German Army had early captured a British air-borne set which revealed the fact that we were using 10 cm. Radar, but the Army had failed to inform the German Navy.

When the R.A.F. Bomber Command undertook the systematic bombing of the industrial centres of Germany they decided to commit their heavy bombers to night operations entirely. In providing navigational aids for their aircraft the British were at a severe disadvantage in comparison with the Germans. While the latter could erect the aerials of their radio-navigational aids on the Channel coast and in the Low Countries only a couple of hundred miles from London, the British were aiming at targets in the heart of Germany 500 to 700 miles away round the curve of the earth. The British radio-navigational methods, known as GEE and OBOE operated from stations far apart on the East coast of England and proved sufficiently accurate for raids on the Ruhr. To guide the pathfinders as far as Berlin, however, a method had to be devised which was not restricted by the curve of the earth. A Radar method was developed known as H_2S—a designation said to have been inherited from an unsuccessful demonstration in its experimental form.

A shovel-shaped reflector confines the radio pulses into a narrow cone which for navigation is rotated about a vertical axis. The aerial is mounted below the plane directed downwards and as it rotates a circular area of the terrain is swept over by the beam. Energy scattered back from

each pulse enters the aerial, is amplified and made to control the brightness of the cathode ray spot. The presentation of the radio echoes on the screen differs from that previously described. In H_2S the trace revolves about a central point about twenty times a minute in synchronism with the rotating aerial. The fluorescent screen is a thin layer of a phosphor which glows for some time after the cathode ray spot has passed. The surface of more or less level ground sends back echoes of moderate strength so that when an aeroplane is passing over it the screen glows faintly all over. The radio rays are reflected from water like light from a mirror and so scatter practically nothing back to the receiver aerial. The concrete buildings of built-up areas, and ships return much stronger echoes and give rise to bright patches on the screen. Circles at various distances from the centre are inscribed on the screen and these show the pilot how far he is from various features of the terrain and the target. The shape of a town and disposition of its main thoroughfares are so clearly painted on the screen that a town can be recognised by comparing it with the shape in a large scale map. The Germans went in for camouflage wholeheartedly, even going to the extent of covering up lakes and rivers with floating disguises and to construct dummy towns realistic enough to deceive the human eye. These flimsy structures did not deceive H_2S however, as the reflections from them bear no resemblance whatever to reinforced concrete and brick.

Counter Measures

Successful radio detection devices were developed independently in America, Britain, France and Germany during the 1930's. It is likely that Germany, realising that Radar was essentially a defensive method found no place for it in her blitzkrieg plans. Certainly she made no great use of the technique until she herself was under air assault. Germany devised an efficient early warning system on the western approaches to Europe and also developed an effective A.A. control but she was always behind the United Nations in novelty of Radar applications.

Nevertheless our losses in massed raids over Berlin became so great that the R.A.F. had to resort to counter-measures. Cover for large raids was given by airborne jammers and for a diversion a mock raid could be simulated by a single aircraft fitted with a spurious echo generator. This was called, appropriately enough, Moonshine. 'Window' was also used to confuse the German A.A. gunners. Dropped from aeroplanes in various forms, usually in the guise of aluminium strips one half wavelength long it gave innumerable strong echoes which cluttered up the screens of enemy cathode ray screens. Ultimately the Germans used Window against us but the British A.I. planes were by then fitted with centimetre Radar which managed to see through Window.

The Germans also developed counter-measures against our Radar. The Scharnhorst escaped while the C.D. (coast defence) stations along the east coast were jammed, but she was detected by a single 10 cm. experimental set which, using a much shorter wavelength, was immune. In the Atlantic struggle too she used a variety of devices such as scattering dummy targets over a wide area of the ocean to confuse the ASV aircraft.

Radar in Peace-Time

Radar protected the cities of Britain and our convoys. It was instrumental in bringing down innumerable enemy planes and sinking many ships. An aspect sometimes lost sight of was the value of the navigational aids it provided in bringing home and safely landing planes in all kinds of weather after operational flights above Germany. It has been reported that in the early years of the war the Germans lost as many planes landing on temporary fields of France at night as were shot down over England.

Navigational aids and aircraft control will probably be the greatest peace-time applications of Radar. For example:—

Large ships: Modifications of H_2S.
Small ships: Land-based beacons triggered from ship.
Aircraft: Varieties of triggered beacons, in larger craft possibly H_2S blind-landing devices.

The fundamental advantage of Radar is that it provides information to the pilot through cloud, fog or falling snow. Meteorological applications of Radar are possible using very short wavelengths. At 10 cm. a moderate rain will scatter back sufficient radiation to give a pattern of the extent of the rain, while at 3 cm. very light rain can be detected. However, even with 1·25 cm. fog particles which make up ordinary cumulus clouds cannot be seen—drops large enough to be considered rain rather than a heavy fog are necessary to give an echo. In the tropics turbulent centres of thunderstorms give a large echo and the possibility exists of guiding planes through gaps in bad weather when the presence of dangerous local storms would make it unsafe to fly unaided.

The biggest influence Radar will have in peace is indirect. Thousands of man-years have gone into the improvement of component design and construction which will accelerate revolutionary technical advances of many kinds, especially radio communication.

Radar techniques are finding their way into atomic physics. Pulse modulation of the cyclotron is used in producing homogeneous beams of neutrons with known velocity. Two hundred 10 cm. Radar machines are being built into a quarter mile long atom smasher which will produce atomic particles with energies of 10^9ev, probably sufficient to disintegrate the fundamental nucleons themselves. The technical potentialities of Radar seem to be limitless but whatever the future of Radar holds it will play no greater role than its part in the saving of Britain. It gave the peoples of the world a second chance for a lasting peace.

Acknowledgment

Many facts quoted are taken from a 'Report on Science at War' issued by the U.S. Office of S.R.O., the War Department and the Navy Department.

Northern Branch Annual Report, 1946

Following the decision to restrict the number of lectures given during the session, there were two very successful gatherings, the first on the occasion of Mr. W. H. Hudspeth's talk on 15 October, 1946, and the second, Mr. A. L. Meston's talk on 26 November, 1946. Both meetings were held at the Museum.

Mr. W. H. Hudspeth delivered a public lecture entitled 'Some Leaves from the Diary of a Van Diemen's Land Official'. His material was based on the diaries of Mr. G. T. W. B. Boyes, Colonial Auditor from 1826-1853. These diaries were the personal comments of Mr. Boyes on the Governors under whom he served, namely Arthur, Franklin, Eardley Wilmot and Denison; and on the people and events of the period. The diaries, hitherto unpublished and unknown, form a valuable commentary on many aspects of the political life of the Colony and contain much new material. The lecture was illustrated by lantern slides.

The Governor, Sir Hugh Binney, presided over the November meeting, which was the first time a meeting of the Branch had been attended by a President of the Society. Mr. A. L. Meston delivered an illustrated lecture on 'The Tasmanians and their Culture'. He dealt first with the history of the contact of the aboriginal with the white man. The aboriginal was then described and related to a negroid stock (unlike the Australian) and his habits and customs, his tools, weapons and utensils described, all aspects of his life and culture being discussed. Mr. Meston drew attention to the many primitive characters shown by the Tasmanian; thus he found their boat to be of a type found very early in the history of man and still to be seen in Abyssinia, on Lake Chad and on Lake Titicaca. The lecture was illustrated by lantern slides.

In addition to these meetings, members of the Branch interested themselves in problems relating to Northern Tasmania, groups being organized to study local history and botany. In the latter case much collecting was carried out, particularly in the Tamar Valley, it being arranged to make the specimens available to Dr. H. D. Gordon for study in connection with his revision of Rodway's 'Tasmanian Flora'.

As a result of the renewed activity of the Branch during the year, eleven new members joined the Society and four members became Life Members.

Officers of the Branch and their terms of office are:—

Chairman: F. Smithies, 1947.

Vice-Chairman: J. E. Heritage, LL.B., 1947, 1948.

Council: C. Craig, M.D., M.S., F.R.A.C.S., 1947, 1948; T. Doe, B.Sc., 1947; J. R. Forward, 1947; Gilbert C. McKinlay, 1947, 1948.

Hon. Secretary-Treasurer: N. J. B. Plomley, M.Sc.

INDEX TO PAPERS

Published in the Papers and Proceedings of the Royal Society of Tasmania

1898-1944

SUBJECT INDEX

(Author Index was printed in 1945 Volume)

BOTANY
ECONOMICS
EDUCATION
ETHNOLOGY
GENERAL SCIENCE
GENERAL ZOOLOGY
GEOGRAPHY
GEOLOGY:—
a. PETROLOGY, MINERALOGY, &C.
b. PALAEONTOLOGY
HISTORY
INVERTEBRATE ZOOLOGY
MEDICINE AND PUBLIC HEALTH
METEOROLOGY AND ASTRONOMY
MISCELLANEOUS.
OBITUARY AND BIOGRAPHICAL
PHYSICS, CHEMISTRY, &C.
VERTEBRATE ZOOLOGY

BOTANY

On the Conservation and Culture of Trees. 1898-1899, p. xliv. Nowell, E. C.
Forestry for Tasmania. 1898-1899, p. liii. Rodway, L.
Additions to the Fungus Flora of Tasmania. 1898-1899, p. 97. Rodway, L.
On a new *Cordyceps*. 1898-1899, p. 100. Rodway, L.
Botanical Notes. 1898-1899, p. li, p. 103. Rodway, L.
Tasmanian Timber. 1900-1901, p. xviii. Green, A. O.
Tasmanian Diatomaceae. 1900-1901, p. 4. Burbury, F. E.
The present and Future Prospects of Timber in Tasmania. 1900-1901, p. 21, pp. xv, xvii. Heyn, Wm.
Botany. 1900-1901, p. 89. Rodway, L.
Additions to Tasmanian Flora. 1900-1901, p. 107. Rodway, L.
Practical Forestry in Tasmania. 1900-1901, p. 127. Mault, A.
On the Advantages of Forest Conservation. 1902, p. xiii. Targett, C. B.
Suggestions for the Establishment of a Tasmanian School of Forestry and Agriculture. 1902, p. 1. Heyn, W.
The Timber Industry. 1902, p. 35. Green, A. O.
Botanical Description of Eucalypti. 1902, p. 72. Rodway, L.
Note on *Eucalyptus linearis* Dehnhardt. 1902, p. 79. Maiden, J. H.
Note on a Species of *Eucalyptus* new to Tasmania. 1902, p. 83. Maiden, J. H.
Some Additions to the Bryological flora of Tasmania. 1902, p. 115. Weymouth, W. A.
Species and Hybridisation. 1903-1905, p. xlix. Podmore, S. M. M.
Agronomy in Relation to Science. 1903-1905, p. 34. Thompson, Rev. E. H.
List of Flowering Plants collected at Kettering. 1903-1905, p. 38, p. xvi. Johnston, R. M.
Records of Tasmanian Botanists. 1909, p. 9. Maiden, J. H.
Tasmanian Onagraceae. 1909, p. 39. Rodway, L.
Note on *Brachycome melanocarpa*. 1909, p. 123. Rodway, L.
Note on *Eucalyptus Risdoni*. 1910, p. 367. Rodway, L.
Geoglossum hirsutum. 1911, p. xx. Rodway, L.
Leaf Impressions. 1912, p. xx. Rodway, L.
The Hymenogastraceae of Tasmania. 1911, p. 21. Rodway, L.
Notes on *Treubia insignis*. 1911, p. 62. Rodway, L.

Tasmanian Mosses. Part I. 1912, p. 3. Rodway, L.
Tasmanian Mosses. Parts I and II. 1912, p. 87. Rodway, L.
A research on the Eucalypts of Tasmania and their essential oils. 1912, p. 139. Baker, R. T., and Smith, H. G. G.
Tasmanian Bryophyta. Part III. 1913, p. 177. Rodway, L.
Notes on Some Tasmanian Eucalypts. 1914, p. 20. Maiden, J. H.
Botanic Evidence in favour of land connection between Fuegia and Tasmania during the present Floristic Epoch. 1914, pp. 32 and 88. Rodway, L.
Pseudopeziza casuarinae. 1915, p. 74. Rodway, L.
Additions to the Tasmanian Flora. 1915, p. 104. Rodway, L.
Notes on a Graft-hybrid. 1915, p. 108. Rodway, L.
Additions to the Bryophyte Flora. 1916, p. 44. Rodway, L.
Tasmanian Bryophyta. 1916, p. 51. Rodway, L.
Contribution to the Flora of Tasmania. 1916, p. 144. Black, R. A.
Mosses common to Tasmania and Queensland. 1917, p. 6. Shirley, J.
Tasmanian Eucalypts. 1917, p. 10. Rodway, L.
Botanical Notes. 1917, p. 105. Rodway, L.
The Thallus of the genus *Parmelia*. 1918, p. 53. Shirley, J.
Notes on the Tasmanian Eucalypts. 1918, p. 82. Maiden, J. H.
Notes and additions to the Fungus Flora of Tasmania. 1919, p. 110. Rodway, L.
Additions to the Fungus Flora of Tasmania. Part III. 1920, p. 153. Rodway, L.
Jungermannia stygia. 1921, p. 166. Pearson, W. H.
Bryophyte notes. 1921, p. 173. Weymouth, W. A., and Rodway, L.
On *Polyporus pulcherrimus*. 1921, p. 176. Rodway, L.
On *Phascum tasmanicum*. 1922, p. 25. Dixon, H. N. and Rodway, L.
A biometric study of the conidia of *Macrosporium* and *Alternaria*. 1922, p. 27. Wakefield, F. W.
Some additions to our flowering plants. 1922, p. 77. Rodway, L.
Description of two underground fungi. 1923, p. 108. Rodway, L.
Tasmanian Hymenogastraceae. 1923, p. 151. Rodway, L.
Two interesting Fungi. 1924, p. 8. Rodway, L.
Tasmanian Discomycetes. 1924, p. 90. Rodway, L.
On the occurrence of *Wolffia arrhiza* in Tasmania. 1925, p. 11. Rodway, L.
Notes on some rare and interesting Cryptogams. 1925, p. 167. Rodway, L.
A note on *Eucalyptus johnstoni*. 1926, p. 118. Rodway, L.
The Marine Algae of Tasmania. 1928, p. 6. Lucas, A. H. S.
The parasitism of *Exocarpus humifusa*. 1928, p. 28. Herbert, A. D.
Notes on the genus *Poria*. 1928, p. 31. Rodway, L. and Cleland, J. B.
Note on *Gautieria* in Tasmania. 1928, p. 72. Rodway, L.
Notes on the genus *Poria*. No. 2. 1928, p. 73. Rodway, L. and Cleland, J. B.
Inheritance of Sex in an Abnormal (Carpellodic) Wall-flower. 1928, p. 119. Nelson, A.
A sketch of the vegetation of the Cradle Mountain, Tasmania and a census of its plants. 1928, p. 132. Sutton, C. S.
Notes on the genus *Poria*. No. 3. 1929, p. 7. Rodway, L. and Cleland, J. B.
The Biological control of noxious weeds. 1929, p. 51. Tilyard, R. J., *R. M. Johnston Mem. Lecture*.
On the Sporophore of the Native Bread *(Polyporus mylitta)*. 1930, p. 94. Dove, H. Stuart.
A contribution to the Orchidology of Tasmania. 1931, p. 105. Rogers, R. S.
A new Tasmanian terrestial orchid. 1932, p. 13. Nicholls, W. H.
The Male Meiotic Cycle in the genus *Eucalyptus*. 1937, p. 41. Cruickshank, F. D. and McAulay, A. L.
Evidence for Existence of a Natural Hybrid between *Eucalyptus globulus* and *E. ovata*. 1937, p. 45. McAulay, A. L.
A Survey of Eucalyptus species in Tasmania. 1937, p. 75. Brett, R. G.
Forest Problems. 1937, p. 153. Steane, S. W.
The Tree and the Soil. 1937, p. 153. Stephens, C. G.
The Description of a New Eucalypt species. 1938, p. 129. Brett, R. G.
Production of Saltants of *Chaetomium globosum* by Monochromatic Ultra-Violet Irradiation. 1938, p. 131. McAulay, A. L.
The Soils and General Ecology of the North East Coastal Regions of Tasmania. 1938, p. 201. Stephens, C. G. and Cane, R. F.
Seaweeds. 1938. p. 230. Gordon, H. D.
Vegetation of Mt. Wellington, Tasmania.—The Plant Communities and a Census of the Plants. 1939, p. 97. Martin, D.
Polyporus mylittae. 1939, p. 135. Gordon, H. D.
Identification of Eucalypts in the Field. 1939, p. 136. Brett, R. G.
Preliminary Survey of the Vegetation near New Harbour, South-West Tasmania. 1940, p. 1. Davis, Consett.
Stem Anatomy of the Genus *Richea*. 1940, p. 33. Curtis, Winifred M.

Additions and corrections to Orchidaceae of Tasmania. 1940, p. 71. Nicholls, H. W. and Olsen, A. M.
Spartina townsendii, its History and Economic Value in reclaiming Tidal Mud. 1940, p. 80. Curtis, Winifred M.
The Vegetation of the Beach. 1940, p. 80. Gordon, H. D.
New Tasmanian Orchids. 1940, p. 83. Olsen, A. M.
Flax. 1940, p. 87. Valentine, J. D.
The Menace of Soil Erosion. 1941, p. 85. Goldstone, C. L.
Tasmanian Potato Problems. 1942, p. 170. Scott, R. A.
Plant Hormones. 1944, p. 131. Curtis, Winifred M.
Variations in *Pultenaea juniperina*, Labill. 1943, p. 197. Curtis, Winifred M.
The Viruses of Plants. 1944, p. 126. White, N. H.

ECONOMICS

Proposed Psychometer Index Designed as an aid to the Better Determination of Common Fungoid Illusions and of the Comparative Value of Mental Concepts. 1903-1905, p. 83. Johnston, R. M.
The Ethical, Economical and Practical Aspects of Old Age Pensions. 1903-1905, p. 95. Johnston, R. M.
Some Economic Aspects of the Eisenach Social Equality Programme. 1903-1905, p. 125. Johnston, R. M.
Conditions upon which the healthy growth of the population of young colonies depend. 1903-1905, p. 27. Johnston, R. M.
Tasmania from a manufacturing and immigration point of view. 1903-1905, p. 49. Green, A. O
Some Social and Economic Aspects of Public Health Work. 1903-1905, p. liii. Elkington, J. S. C.
Some Developments in 1905-1906 conducive to Tasmanian Progress. 1906-1907, p. 1. Strickland, Gerald.
On State Borrowing and Sinking Funds for the Redemption of State Debts regarded from an Economical Point of View. 1908, p. v. Johnston, R. M.
State Borrowing and Sinking Funds. 1908, p. 10. Johnston, R. M.
The Theory of the Quota in Proportional Representation. I. 1912, p. 49. II. 1913, p. 15. Piesse, E. L.
Bibliography of Proportional Representation. 1913, p. 39. Piesse, E. L.
Demography of Tasmania. 1913, p. 173. Giblin, L. F.
Observations Regarding Accumulated Capital Wealth. 1918, p. 1. Johnston, R. M.
The Study of Economic Science. 1935, p. 96. Dallas, K. M.
General Survey of Developments of Tasmanian Economy, its present position and prospects. 1936, p. 101. Giblin, L. F.
Economic Science and the Community. 1937, p. 154. Mauldon, F. R. E.
Economic Background of the European Situation. 1939, p. 137. Walker, E. R.
Social Services and Their Importance in War Time and Post War Period. 1942, p. 165. Dowsett, W. T.

EDUCATION

The New Education. 1906-1907, p. xiii. Johnson, J. A.
Recent Developments in Experimental Pedagogy. 1913, p, 288. Johnson, J. A.
The Examiners on the Defensive. 1936, p. 102. Parker, H. T.
Observations on Educational Institutions in the United States of America, Canada, England, Scotland, and Ireland. 1936, p. 99. Brooks, G. V.
Biology and Education. 1943, p. 242. Unwin, E. E.
The Evolution of an Environment. 1943, p. 246. Parker, H. T.

ETHNOLOGY

Note on Discussion Concerning Stone Implements of Aborigines following Professor Tyler's Paper at B.A.A.S. 1898-1899, p. 111.
The Tasmanian Aborigines. 1898-1899, p. 65. Walker, J. B.
Description and Measurements of Some Mallicolo Crania. 1898-1899, p. 106. Clarke, Arthur.
Note on Museums and Aborigines. 1900-1901, p. V & VI. Montgomery, H. H.
Japan. Its People and Industries. 1903-1905, p. xxxiii. Dr. Hocken.
Skull of William Lannee—letter from the Secretary of the Royal College of Surgeons of England. 1903-1905, p. xxxix. Cowell, J. Forrest.
Note dealing with knives and waddies of Tasmanian Aborigines. 1903-1905, p. xxxix. and xl. Morton, Alex.
Notes on Stone knives of Tasmanian Aborigines. 1903-1905. p. xxxix. Legge, R. W.
Evolution of words. (Abstract.) 1903-1905, p. lix. Ritz, H. B.
Aboriginal Stone Axes. 1906-1907, p. xi. Philp, J. E.
Australian Aborigines. 1906-1907. p. xxvi. Dr. Klatsch.
Notes on the Tasmanian Amorpholithes. 1906-1907, p. iii, pp. 1, 30. Noetling, Fritz.
Notes on a Chipped Boulder found near Kempton. 1908, p. 1. Noetling, F.
A Native Burial Ground on Charlton Estate, near Ross. 1908, p. 36. Noetling, F.

The Native Quarry at Syndal, near Ross. 1908, p. 44. Noetling, F.
The Aboriginal Designations for Stone Implements. 1908, p. 69. Noetling, F.
On Dr. Noetling's Conclusions Respecting the Aboriginal Designations for Stone Implements. 1908, p. 68. Ritz, H. B.
An Introduction to the Study of the Aboriginal Speech of Tasmania. 1908, p. 73. Ritz, H. B.
A peculiar group of Tronattas. 1909, p. 1. Noetling, Fritz.
Red Ochre and Its Uses by the Aborigines of Tasmania. 1909, p. 30. Noetling, Fritz.
The Speech of the Tasmanian Aborigines. 1909, p. 44. Ritz, H. B.
Rocks Used in the Manufacture of Tronattas. 1909, p. 85. Noetling, F.
Notes on the Names given to Minerals and Rocks by the Aborigines of Tasmania. 1909, p. 103. Noetling, Fritz.
The Antiquity of Man in Tasmania. 1910, p. 231. Noetling, Fritz.
On Certain Types of Stones used by the Aborigines. 1910, p. 262. Dove, Stuart H.
Comparison of Tasmanian Tronatta with the Archaeolithic Implements of Europe. 1910, p. 265. Noetling, Fritz.
The Food of the Tasmanian Aborigines. 1910, p. 279. Noetling, Fritz.
The Norman Vocabulary. 1910, p. 333.
Notes on the Norman Vocabulary. 1910, p. 343. Ritz, H. B.
Note on Duterreau's Reconciliation Picture together with information regarding Duterreau. 1911, p. xxi, 134. Noetling, Fritz.
Notes on the Marks of Percussion on Siliceous Rocks. 1911, p. 1. Noetling, Fritz.
The Manufacture of the Tero-Watta. 1911, p. 38. Noetling, Fritz.
Notes on the Hunting Sticks (Lughrana), Spears (Perena), and Baskets (Tughbrana) of the Tasmanian Aborigines. 1911, p. 64. Noetling, Fritz.
Further Notes on the Habits of the Tasmanian Aborigines. 1911, p. 102. Noetling, Fritz.
List of the Native Words of the Oyster Bay Tribes Van Diemen's Land. 1913, p. 79. Beattie, J. W.
Notes on the List of Native Words of the Oyster Bay Tribe presented by J. W. Beattie. 1913, p. 82. Ritz, H. B.
A Tasmanian Aboriginal Skull found on Tasman Island. 1913, p. 287. Beattie, J. W.
Additional Note on Stones used by the Aborigines. 1914, p. 87. Dove, H. Stuart.
Discovery of an Aboriginal Chipped Flake in deep ground near Gladstone. 1916, p. 48. Twelvetrees, W. H.
Preliminary Note upon the Discovery of Aboriginal Remains at Eaglehawk Neck. 1918, p. 118. Lord, Clive.
Peron's finding of the Aboriginal Tomb. 1919, p. 45. Lord, Clive.
Note on Maori Chiefs. 1919, p. 48. Lord, Clive.
Note by Bligh on the "Wig-wams" of the Aborigines. 1920, p. 120.
A Descriptive Catalogue of the Osteological Specimens relating to the Tasmanian Aborigines contained in the Tasmanian Museum. 1920, p. 137. Crowther, W. L. and Lord, Clive.
Description of Two Tasmanian Aboriginal Crania. 1921, p. 168. Crowther, W. L. and Lord, Clive.
The Concave Stone Implements of the Tasmanian Aboriginals. 1921, p. 182. Horne, Dr. George.
A Note on the Burial Customs of the Tasmanian Aborigines. 1923, p. 45. Lord, Clive.
R. M. Johnston Memorial Lecture. Geological Evidence of the Antiquity of Man in the Commonwealth with special reference to the Tasmanian Aborigines. 1923, p. 109. David, Sir T. W. Edgeworth.
Notes on the Habits of the Extinct Tasmanian Race. 1924, p. 136. Crowther, W. L.
Some Notes upon a Tasmanian Aboriginal Skull. 1925, p. 5. Scott, H. H. and McClinton.
Notes on the Habits of the Extinct Tasmanian Race. 1926, p. 165. Crowther, W. L.
Notes on a Series of "Pounders" from Certain Localities of the West Coast of Tasmania. 1925, p. 25. Legge, R. W.
On Some Diminutive Types of Tasmanian Stone Implements. 1928, p. 87. Legge, R. W.
Chipped Stone Tools of the Aboriginal Tribes East and North-East of Lake Eyre, South Australia. 1928, p. 123. Aiston, George.
Tasmanian Stone Culture, Some Notes on Distinctive Types, Spokeshaves, Borers, and Chipping Tools, and Their Probable Usages. 1929, p. 39. Legge, R. W.
Method of Mounting Stone Tools on Koondi. Tribes East and North-East of Lake Eyre. 1929, p. 44. Aiston, George.
Magic Stones of the Tribes East and North-East of Lake Eyre. 1929, p. 47. Aiston, George.
On Two Tasmanian Crania (Immature). 1929, p. 123. Crowther, W. L.
Aboriginal Rock-Carvings on the North-West Coast of Tasmania. 1931, p. 12. Meston, A. L.
Preliminary Note on the Supposed Aboriginal Rock Carvings at Mersey Bluff, Devonport. 1931, p. 112. Scott, E. O. G.
Aboriginal Rock Carvings in Tasmania. 1932, p. 1. Meston, A. L.
On an Unusual Form of Stone from a Tasmanian Native Camp. 1933, p. 20. Dove, H. Stuart.
Notes on the Habits of the Extinct Tasmanian Race. No 3. Disposal of Their Dead. 1933, p. 22. Crowther, W. L.
Preliminary Notes on a Rock Shelter in Eastern Tasmania. 1933, p. 28. Heyward, F

The Antiquity of Man in Tasmania. 1934, p. 83. Lewis, A. N.
Observations on Visits of the Tasmanian Aborigines to the Hunter Islands. 1935, p. 155. Meston, A. L.
The Problem of the Tasmanian Aborigine. 1936, p. 85. Meston, A. L.
Aboriginal Rock Carvings found at Trial Harbour. 1937, p. 47. Jones, J. F.
Notes on the Habits of the Extinct Tasmanian Race. 1938, p. 209. Crowther, W. E. L. H.
Relationships of the Tasmanian Canoe Raft. 1938, p. 221. Pearson, Joseph.
Notes on the Last of the Tasmanian Race. 1938, p. 232. Angel, S.
Some Aspects of the Ecology of the Aboriginal Inhabitants of Tasmania and Southern Australia. 1939, p. 1. Cleland, J. B.
The Culture of the Tasmanians. 1940, p. 83. Meston, A. L.
A Tasmanian Stone Implement made from Bottle Glass. 1941, p. 1. Tindale, H. B.

GENERAL SCIENCE

Telegraphy Without Wires. 1898-1899, p. vii. Self, Thos.
Australian Association for the Advancement of Science. 1902. Meeting. 1898-1899. p. lvii.
Collisions at Sea. How they are caused. 1906-1907, p. xliv. Ward, W. F.
Electricity and Matter. 1906-1907, p. xlvi. Spencer, H. J.
Inventions and Discoveries for the Year. 1906-1907, p. xxviii. Strickland, Gerald.
Review of Scientific Progress. 1907-1908. 1909. p. i. Strickland, Gerald.
Weighing the Earth. 1910, p. 376. Blackman, A. E.
Science and Utopia. 1937, p. 152. Cerutty, L.
Science and The Farmer. 1939, p. 142. Bond, P. H.
Polishing and Sliding of Ski. 1939, p. 137. Bowden, F. P.
Scientific Research in Relation to Industry. 1940, p. 78. Richardson, A. E. V.
Textile Dyeing. 1941, p. 85. Boag, J. B.
Pasteurization. 1943, p. 246. Rees, H. V.
Synthetic Rubber. 1942, p. 171. Bond, P. H.

GENERAL ZOOLOGY

Australian Fauna and Medical Science. 1925, p. 203. Mackenzie, N. Colin.
R M. Johnston Memorial Lecture; Science and Sea Fisheries with Special Reference to Australia. 1934, p. 1. Dakin, W. J.
The Breathing of Animals. 1935, p. 195. Unwin, E. E.
Heredity. 1935, p. 198. (Abstract of Lecture.) Pearson, Joseph.
Tasmanian Biological Survey. 1933, p. 235. Evans, J. W., Hickman, V. V., and Martin, D.
Can Animals Think? 1940, p. 85. Parker, H. T.
The Voices of Animals. 1942, p. 164. Unwin, E. E.
A Century of Ideas on Evolution. 1943, p. 159. Ashby, Eric.
Concealing Coloration and Camouflage, 1943, p. 240. Pearson, Joseph.
The Geographical Distribution of Animals. 1943, p. 244. Pearson, Joseph.

GEOGRAPHY

Notes on a Visit to Port Davey. 1898-1899, p. iii. Beattie, J. W.
Notes on a Visit to West Australia. 1898-1899, p. v. Morton, Alex.
Hartz Mts. and the Picton. 1899, p. xxxv. Beattie, J. W.
Macquarie Harbour. 1898-1899, p. xxviii. Bell, Napier.
West Coast Mining Fields. 1899, p. xxxix. Beattie, J. W.
The Cartography of Terra Australis and New Holland. 1898-1899, p. xli. Walker, J. B.
West Coast Mining Fields. 1898-1899, p. xxxix. Beattie, J. W.
Light Railways for Tasmania. 1900-1901, p. vii. p. ix. Moore, G. E.
Trip to Barn Bluff. 1900-1901, p. xxv. Beattie, J. W.
Tasmania as a Manufacturing Centre. 1902, p. iv. p. viii. Naghten, R. E.
Contribution to the Physiography of Tasmania. 1902, p. 138. Legge, W. V.
Japan: Its People and Industries. 1903-1905, p. xxxiii. Dr. Hocken.
Tasmania from a Manufacturing and Immigration Point of View, and Her Natural Advantages. 1903-1905, p. 49. Green, A. O.
Tropical Australia—Is it fitted for a Working White Race? 1903-1905, p. lxiii. Elkington, J. S. C.
Notes on King Island. 1906-1907, p. x. Johnston, R. M. and Morton, Alex.
Note on the Ben Lomond Plateau and the Discovery of high land at the north end. 1906-1907, p. xxxiv. Legge, W. V.
The Ben Lomond Range and the Height of Legge Tor. 1906-1907, p. xxxvii. Giblin, L. F. and Piesse, E. L.

The Northern Territory. 1906-1907, p. xliii. Dobson, Henry.
The River Gordon and Need for Reservation. 1908, p. 31. Beattie, J. W.
The Height of Ben Lomond. 1913, p. 5. Giblin, L. F., Piesse, E. L., and Hutchison, H. R.
A Rectification in the Cartography of North-east Tasmania. 1913, p. 76. Legge, W. V.
Note on Strzelecki's Determinations of Heights in Tasmania. 1913, p. 116. Giblin, L. F., Piesse, E. L., Hutchison, H. R.
A Determination of the Height of Barn Bluff. 1917, p. 1. Hutchison, H. R., Giblin, L. F., and Butler, W. F. D.
Macquarie Island and its future. 1922, p. 40. Mawson, Douglas.
The South Coast and Port Davey, Tasmania. 1927, p. 1. Lord, Clive.
Hydro-Electric Developments in Tasmania. 1935, p. 197. Maclean, W.
Ruined Cities of Southern Rhodesia. 1939, p. 142. Meston, A. L.
Frenchman's Cap. 1941, p. 84. Smithies, F.
Frenchman's Cap. 1942, p. 166. Emmett, E. T.
Place Names in Tasmania. 1942, p. 167. Meston, A. L.

GEOLOGY

(a) Petrology, Mineralogy, &c.

Notes on the Geology of La Perouse. 1898-1899, p. ii. Nicholls, H. W.
Supplementary Note on Limurite in Tasmania. 1898-1899, p. 1 and p. 56. Twelvetrees, W. H. and Petterd, W. F.
On Hauyne-trachyte and Allied Rocks in the Districts of Port Cygnet and Oyster Cove. 1898-1899, p. 3 and p. xxvii. Twelvetrees, W. H. and Petterd, W. F.
Felsites and associated rocks of Mt. Read and Vicinity. 1898-1899, p. 33. Twelvetrees, W. H. and Petterd, W. F.
Nepheline and Melilite Rocks from the Shannon Tier. 1898-1899, p. 60. Twelvetrees, W. H. and Petterd, W. F.
Notes on Coral Reefs, with special reference to the Funafuti Bore. 1898-1899, p. 92. Stephens, T.
On the Mesozoic Dolerite and Diabase in Tasmania. 1898-1899, p. 47. Twelvetrees, W. H. and Petterd, W. F.
Are all the Colossal Igneous Caps of the Tasmanian Tiers and of the Lofty Mountain Plateaux True Sills? 1898-1899, p. xlix. Johnston, R. M.
On the Occurrence of a New Species of Garnet at Port Cygnet. 1898-1899, p. 74. Macleod, W. A. and White, O. E.
Notes on the Fayalite Basalt from One Tree Point. 1898-1899, p. 75. Macleod, W. A. and White, O. E.
The Falls of Niagara as a Geological Chronometer. 1900-1901, p. iii. Hogg, E. G.
On Some Additions to the List of Minerals known to occur in Tasmania. 1900-1901, p. xiii. Petterd, W. F.
Notes on Coal Discoveries at Wynyard, Tasmania. 1900-1901, p. xxii. Johnston, R. M.
Supplementary Notes on Some Antarctic Rocks and Minerals. 1900-1901, p. 38. Macleod, W. A. and White, O. E.
Further Observations on Some Obsidian Buttons. 1900-1901, p. 42. Stephens, T.
The Glacial Beds of Peppermint Bay. 1900-1901, p. 45. Hogg, E. C.
Description of a "Meteorite" from Castray River, Tasmania. 1900-1901, p. 48. Petterd, W. F.
Description of and Analysis of a New Species of Mineral 'Petterdite', a New Oxychloride of Lead. 1900-1901, p. 51. Twelvetrees, W. H.
Microscopic Structure of Some Tasmanian Rocks. 1900-1901, p. 53. Petterd, W. F.
Outlines of the Geology of Tasmania. 1900-1901, p. 58. Twelvetrees, W. H.
The Minerals of Tasmania. 1900-1901, p. 75. Petterd, W. F.
Note on Itacolumite or Flexible Sandstone. 1900-1901, p. 134. Hogg, E. G.
Notes on Unrecorded and Other Minerals Occurring in Tasmania. 1902, p. 18. Petterd, W. F.
Trachydolerite in Tasmania. 1902, p. 133. Twelvetrees, W. H.
On Certain Calcareous Nodules. 1902, p. 136. Hogg, E. G.
Contribution to the Physiography of Tasmania. 1902, p. 138. Legge, W. V.
The Tourmaline-bearing Rocks of the Heemskirk District. 1902, p. 143. Waller, G. A. and Hogg, E. G.
A Geological Excursion to Port Cygnet. 1903-1905, p. iv. and p. 41. Twelvetrees, W. H.
The Glacial Beds of Port Cygnet. 1903-1905, p. xxxvi. Hogg, E. G.
Rocks from Port Cygnet. 1903-1905, p. xviii. Twelvetrees, W. H.
Notes on Tasmanian Minerals. 1903-1905, p. xviii and p. 62. Petterd, W. F.
Notes on the Reidle Bay Conglomerates, Maria Island. 1903-1905, p. xxvi. Johnston, R. M.
Notes on Tasmanian Minerals. 1903-1905, p. xlvi. Petterd, W. F.
Coal and a Coal Mine. 1903-1905, p. liii. Murray, K. L.
Record of Obsidianites or Obsidian Buttons found in Tasmania. 1903-1905, p. lvii. Twelvetrees, W. H.

Dundasite. 1903-1905, p. lviii. Petterd, W. F.
Notes on Jacupirangite in Tasmania. 1903-1905, p. 73. Twelvetrees, W. H.
Notes on Some Additional Minerals recently determined with New Localities for Species Known to Occur in Tasmania. 1903-1905, p. 75. Petterd, W. F.
The native Quarry at Syndal, near Ross. 1908, p. 44. Noetling, F.
Rocks Used in the Manufacture of Tronattas. 1909, p. 85. Noetling, F.
Notes on the Names given to the Minerals and Rocks by the Aborigines of Tasmania. 1909, p. 103. Noetling, F.
Contribution to the Geology of Tasmania—The Pre-Cambrian Rocks. 1909, p. 124. Ward, L. Keith.
Notes on the Glacial Beds at Freestone Bluff, Sandy Cove, near Wynyard. 1909, p. 157. Noetling, F.
Geological Notes on the Country Traversed by the Derwent Valley Railway Extension. 1909, p. 170. Stephens, T.
The Minerals of Tasmania. 1910, p. 1. Petterd, F.
The Antiquity of Man in Tasmania. 1910, p. 231. Noetling, F.
Weighing the Earth. 1910, p. 376. Blackman, A. E.
Notes on the Mineral Springs of North West Tasmania. 1912, p. 85. Stephens, T.
Notes on the Section at One Tree Point, near Hobart. 1913, p. 95. Noetling, F.
Notes on the Geology of the Cradle Mountain District. 1916, p. 29. Benson, W. N.
Notes on the Geology of Wineglass Bay. 1919, p. 18. Clemes, W. H.
Notes on the Geology of Maria Island. 1919, p. 33. Clemes, W. H.
A Preliminary Sketch of the Glacial Remains Preserved in the National Park of Tasmania. 1921, p. 16. Lewis, A. N.
The Progress of Geological Research in Tasmania since 1902. 1921, p. 111. Hills, Loftus.
A Supplementary Note to "A Preliminary Sketch of the Glacial Remains Preserved in the National Park of Tasmania". 1921, p. 177. Lewis, A. N.
Some Geographical Notes on a Model of the National Park at Mt. Field. 1921, p. 188. Taylor, Griffith.
A Further Note on the Topography of Lake Fenton and District. National Park, Tasmania. 1922, p. 32. Lewis, A. N.
Notes on a Geological Reconnaissance of Mt. Anne and the Weld River Valley, South Tasmania. 1923, p. 9. Lewis, A. N.
Geological Evidence of the Antiquity of Man in the Commonwealth with Special Reference to the Tasmanian Aborigines. 1923, p. 109. David, T. W. Edgeworth.
Notes on a Geological Reconnaissance of the Mount La Perouse Range. 1924, p. 9. Lewis, A. N.
Note on a Cliff Section near Cape Paul Lamanon. 1924, p. 45. Lewis, A. N.
Notes on a Geological Reconnaissance of the Lake St. Clair District. 1924, p. 59. Clemes, W. H.
Note on the Isotatic Background of Tasmanian Physiography. 1926, p. 1. Lewis, A. N.
The Oil Shales of Tasmania. 1926, p. 42. Reid, A. McI.
Volcanic Rock at One Tree Point (Note of Paper by W. Aurousseau). 1926, p. 170. Lewis, A. N.
Discussion on Note on the Isotatic Background of Tasmanian Physiography. 1927, p. 66. Lewis, A. N. p. 69. Clemes, W. H. and Giblin, L. F.
A Further Account of the Geology of the Catamaran Coal Field. 1927, p. 188. Lewis, A. N.
Note on the Origin of the Great Lake and Other Lakes on the Central Plateau. 1932, p. 15. Lewis, A. N.
A Correlation of the Tasmanian Pleistocene Glacial Epochs and Deposits. 1933, p. 67. Lewis, A. N.
Correlation of the Tasmanian Pleistocene Raised Beds and River Terraces in Unglaciated Areas. 1934, p. 75. Lewis, A. N.
Glacial Features in the D'Entrecasteaux Valley. 1934, p. 87. Lewis, A. N. and Murray, J. N.
Our Pulsating World: The Influence of Earth Movements on Human Development. 1935, p. 1. Lewis, A. N.
A Record of Volcanic Activity in Tasmania during Triassic Times. 1937, p. 31. Lewis, A. N. and Voisey, A. H.
The Age and Physiographical Relationships of Some Cainozoic Basalts in Central and Eastern Tasmania. 1938, p. 175. Edwards, A. B.
Note on Pleistocene Glaciation—Mt. Field to Strahan. 1938, p. 161. Lewis, A. N.
Geology of the Tyenna Valley. 1939, p. 33. Lewis, A. N.
Experiences of a Geologist in the Field. 1939, p. 134. Whitehouse, F. W.
Time Scales in Recent Tasmanian Geological History. 1939, p. 135. Lewis, A. N.
Lower Tertiary (Miocene) Marine Sedimentary Rocks of the Far North-Western Districts of Tasmania. 1940, p. 11. Nye, P. B.
On a Remnant of a Stripped Peneplain of Palaeozoic Age at Mt. Sedgwick in Western Tasmania. 1940, p. 19. Edwards, A. B.
Studies in Tasmanite Shale Oil. 1940, p. 23. Cane, R. F.
Tasmanian Physiographical History. 1940, p. 88. Lewis, A. N.
The Nitrogen Bases in Tasmanite Shale Oil. 1941, p. 55. Cane, R F.
The Geological Work of Dr. A. N. Lewis. 1943, p. 251. Thomas, D. E.
Time Scales in the Development of Tasmanian Physiography. 1944, p. 19. Lewis, A. N.
Pleistocene Glaciation in Tasmania. 1944, p. 41. Lewis, A. N.

(b) Palaeontology. (Zoological)

Notes on the Humeri of a Tasmanian Labyrinthodont. 1898-1899, p. 27. Twelvetrees, W. H. and Petterd, W. F.
Description of a Tasmanian Species of Halysites. 1898-1899, p. 81. Etheridge, Robert, Jun.
Observations Regarding the Discovery of Portion of a Fossil Reptile found on the North West Coast. 1900-1901, p. 9. Johnston, R. M.
Further Notes on the Permo-Carboniferous Fossil Cliffs at Darlington, Maria Island. 1900-1901, p. 11. Johnston, R. M.
Evidence of Graptolites in Tasmania. 1902, p. 16. Hall, T. S.
Some Remarks on *Spirifer Triangularis*. 1903-1905, p. xxvi. Johnston, R. M.
Antiquity of the Amorpholithes found in Tasmania. Notes on the Tasmanian Amorpholithes. 1906-1907, pp. iii, 1, and 30. Noetling, F.
Fossil Bone from near Circular Head. 1911, p. xix. Stephens, T.
The Occurrence of Gigantic Marsupials in Tasmania. 1911, p. 124. Noetling, F.
Notes on a Fossil Whale from Wynyard. 1913, p. 167. Scott, H. H.
A Note on *Palorchestes* as a Tasmanian Pleistocene Genus. 1915, p. 100. Scott, H. H.
Critical Remarks on the Table Cape Fossil Mollusca in the Johnston Collection. 1918, p. 69. May, W. L.
A Revised Census of the Mollusca and Brachiopods in the Table Cape Beds. 1918, p. 101. May, W. L.
Studies in Tasmanian Mammals—Living and Extinct. *Nothotherium Mitchelli*. 1920, pp. 13, 76, and 97. Scott, H. H. and Lord, Clive E.
Nothotheria and Allied Animals. 1921, p. 1. Scott, H. H. and Lord, Clive E.
Studies in Tasmanian Mammals—Living and Extinct. The Cave Deposits at Mole Creek. 1921, p. 6. Scott, H. H. and Lord, Clive E.
New Species of Fossil Shells from Table Cape. 1921, p. 9. May, W. L.
Studies in Tasmanian Mammals—Living and Extinct, *Zaglossus Harrissoni* Sp. nov. 1921, p. 13. Scott, H. H. and Lord, Clive E.
Description of a New Species of Fossil Loricella. 1921, p. 37. Ashby, E.
Studies in Tasmanian Mammals. Living and Extinct. Cetacean Remains from the Fossil Beds at Wynyard. 1921, p. 180. Scott, H. H. and Lord, Clive E.
Studies in Tasmanian Mammals. Living and Extinct. Pleistocene Marsupial from King Island. 1923, p. 1. Scott, H. H. and Lord, Clive E.
Studies in Tasmanian Mammals Living and Extinct *Nothotherium Victoriae* Owen. 1923, p 4. Scott, H. H. and Lord, Clive E.
Studies in Tasmanian Mammals. Living and Extinct. Giant Wallaby. *Macropus Anak*. Owen. 1923, p. 6. Scott, H. H. and Lord, Clive E.
Studies in Tasmanian Mammals. Living and Extinct. On Certain Tasmanian Pleistocene Marsupials. 1924, p. 53. Scott, H. H. and Lord, Clive E.
Tasmanian Giant Marsupials. 1925, p. 1. Scott, H. H. and Lord, Clive E.
On a Supposed Phyllocarid from the Older Palaeozoic of Tasmania. 1925, p. 79. Chapman, F.
On Some Remarkable Annelid Remains from Arthur River. N.W. Tasmania. 1928, p. 1. Chapman, F.
Tasmanian Graptolite Record. 1928, p 69. Keble, R. A.
Definition of a New Fossil Chiton. 1929, p. 36. Ashby, E.
A Re-examination of the Skeletal Characters of *Wynyardia bassiana*, an Extinct Tasmanian Marsupial. 1930, p. 96. Jones, F. Wood.
Tasmanian Trilobites. 1937, p. 145. Lewis, A. N.
Notes on *Productus subquadratus* Morris, and Tasmanian Trilobites. 1938, p. 234. Lewis, A. N.
Lower Ordovician Fossils from Junee, Tasmania. 1939, p. 61. Kobayashi Teiichi.
Lower Ordovician Fossils from Caroline Creek near Latrobe, Mersey River, Tasmania. 1939, p. 67. Kobayashi Teiichi.
Lower Tertiary (Miocene) Marine Sedimentary Rocks of the Far North-Western Districts of Tasmania. 1940, p. 11. Nye, P. B.
Report on a Collection of Fossils from Marrawah, Smithton. 1940, p. 16. (app.) Chapman, E.
Some Tasmanian Palaeozoic corals. 1941, p. 3. Hill, Dorothy.
Some Fossils from the Dundas Series, Dundas. 1944, p. 1. Henderson, Q. T. and Thomas, D. E.
A Critical Review of Tasmanian Graptolite Records 1944, p. 9. Thomas, D. E.
Middle Miocene Limestone from Cape Barren Island. 1944, p. 13. Crespin, I.
Middle Miocene Limestones from King Island. 1944, p. 15. Crespin, I.

Palaeontology (Botanical)

Notes on a Fossil Wood Found at Cox's Bight. 1898-1899, p. 85. Macleod, W. A.
Notes on a Fossil Tree at Barnes Bay. 1903-1905, p. xxix. Johnston, R. M.
Notes on the Fossil Flora and a Fossil Fish discovered at Tinder Box Bay. 1903-1905, p. xxvi. Johnston, R. M.

Note on the Occurrence of a Fossil Tree Embedded in Drift on the North West Coast of Tasmania. 1909, p. 82. Stephens, T.
Notes on the Discovery of a New Fossil Fruit from the Deep-lead Tin Drifts at Derby, Tasmania. 1918, p. 3. Johnston, R. M.
Notes on Some Tasmanian Mesozoic Plants. 1924, p. 73. Walkom, A. B.
Notes on Some Tasmanian Mesozoic Plants. Part II. 1925, p. 63. Walkom, A B.
Tasmanian Cycadophyta. Part I. 1930, p. 90. Part II. 1933, p. 65. Scott, H. H.
Notes on the Fossil Spores in an Oil Shale from Tasmania. 1931, p. 32. Singh, T. C. H.
Notes on a Fossil Pine from the Permo-Carboniferous (*Dadoxylon penmani*. Sp. nov.). 1933, p. 17. Scott, H. H.
Occurrence of Fossil Plants at Warrentinna, Tasmania. 1936, p. 73. Cookson, I. C.
Record of Glossopteris from Cygnet. 1939, p. 95. Lewis, A. N.

HISTORY

Two Journeys Westward—Mr. W. S. Sharland in 1832 and Sir John Franklin in 1842. 1898-1899, p. lii. H. H. Montgomery.
The Tasmanian Aborigines—Their Customs and Habits. 1898-1899, p. 65. J. B. Walker.
Borchgrevink Expedition (Welcome to). 1898-1899, p. xvi.
Borchgrevink Expedition (Welcome to). 1900-1901, p. 115.
Antarctic Expedition, Sir Geo. Newnes, Southern Cross. 1898-1899, pp. xvi. 115. Anon.
Some Account of the Work and Workers of The Tasmanian Society and the Royal Society of Tasmania from 1840 to 1900. 1900-1901, p. 109. Alex. Morton.
Records of Tasmanian Botanists. 1909, p. 9. Maiden, J. H.
Notes on Publications of the Royal Society. 1910, p. 223. Fritz. Noetling.
The Antiquity of Man in Tasmania. 1910, p. 231. Noetling, Fritz.
Welcome to Capt. Amundsen. 1912, p. xii.
The Foundation and Early Work of the Royal Society of Tasmania. 1913, p. 117. Piesse, E. L.
The Early Tasmanian Press and Its Struggle for Freedom. 1916, p. 1. Heaton, H.
The Foundations of Public Institutions for Secondary Education in Tasmania. 1917, p. 21. Butler, W. F. D.
The foundation of the National Park. 1918, p. 74. Lord, Clive E.
The Early History of Maria Island. 1919, p. 39. Lord, Clive E.
Notes on Tasmanian Whaling. 1919, p. 130. Crowther, W. E. L. H.
The Early History of Bruny Island. 1920, p. 114. Lord, Clive E.
The First Discovery of Port Davey and Macquarie Harbour. 1920, p. 160. Kelly, James.
France and Australia—"The Prise de Possession". 1921, p. 147. Dunbabin, Thos.
Tasmanian State Records. 1921, p. 156. Moore-Robinson, J.
Notes on Captain Bligh's Visits to Tasmania in 1788 and 1792. 1922, p. 1. Lord, Clive E.
Note on the Journal of Captain Charles O'Hara Booth. 1925, p. 152. Giblin, R. W.
Tasman's Landing Place. 1925, p. 195. Halligan, G. H.
Notes on the Currency of Early Tasmania. 1925, p. 209. Reynolds, John.
Extracts from Diary. Excursion to Port Davey. 1925, p. 1. Franklin, Lady.
The Planting of the Dutch Flag in Tasmania in 1642. 1926, p. 25. Lord, Clive E.
Notes on the Constitutional Separation of Tasmania from New South Wales. 1926, p. 35. Reynolds, John.
The South Coast and Port Davey. 1927, p. 1. Lord, Clive E.
Notes on the Diary of the Rev. Robert Knopwood 1805-1808. 1927, p. 78. Lord, Clive E.
The Growth of Self-Government in Tasmania. 1927, p. 176. Meston, A. L.
Flinders, Baudin and Brown at Encounter Bay. 1929, p. 1. Giblin, R. W.
Robert Brown at Port Dalrymple. 1929, p. 25. Giblin, R. W.
Voyage of the "Mary and Sally" to Macquarie Island for the purpose of obtaining sea elephant oil and seal skins. 1932, p. 39. Crowther, W. E. L. H.
Letters of John Martin, the Irish Political Prisoner. 1932, p. 47. McElroy, Mrs. J. A.
Notes on the Memorial of Alfred Barrett Biggs, Astronomer. 1933, p. 26. Meston, A. L.
Experiences of a Settler in the Early Days of Van Diemen's Land. 1935, p. 139. Hudspeth, W. H.
Hydro-Electric Development in Tasmania. 1935, p. 197. Maclean, W. E.
A Sealing Voyage to Bass Straits by the Schooner "Brothers" in 1813. 1936, p. 79. Crowther, W. E. L. H.
The Times and Some Contemporaries of Lieutenant Colonel Paterson, Founder of Launceston. 1936, p. 98. McElroy, Mrs. J. A.
Development of Tasmanian Economy. 1936, p. 101. Giblin, L. F.
D'Entrecasteaux. An Account of his Life, his Expedition and his Officers. 1937, p. 53. Hogg, G. H.
The Semaphore Telegraphic System of Early Van Diemen's Land. 1937, p. 155. Masters, W. E.
The Development of the Guano Trade from Hobart Town in the Fifties and Sixties. 1938, p. 213. Crowther, W. E. L. H.

Lt. Governor Collins and his Royal Marines. 1938, p. 231. McElroy, J. A.
Notes on the last of the Tasmanian Race. 1938, p. 232. Angel, S.
The Life and Work of John Gould. 1938, p. 233. Butler, A. L.
Some Aspects of the Ecology of the Aboriginal Inhabitants of Tasmania and Southern Australia. 1939, p. 1. Cleland, J. B.
Tasmania's Oldest Road. 1939, p. 139. Emmett, E. T.
The Shipbuilding and Seafaring Pioneers of Tasmania. 1940, p. 79. O'May, H.
A Century-old Dictator. 1940, p. 81. Rait, B. W.
Early Days of New Norfolk. 1940, p. 81. Emmett, E. T.
The Economic Life of a New Guinea People. 1940, p. 82. Wedgewood, C. H .
Francis Bacon. 1940, p. 83. Cerutty, L.
The Culture of the Tasmanians. 1940, p. 83. Meston, A. L.
Romance of Tasman's Peninsula. 1940, p. 86. Barnard, L. E.
Sir George Arthur, Lt. Governor of Van Diemen's Land 1824-1836. 1941, p. 81. Wayn, A. L.
Place Names in Tasmania. 1942, p. 167. Meston, A. L.
Abel Janzoon Tasman. 1942, p. 169. Crowther, W. E. L. H.
A Century of Ideas on Evolution. 1943, p. 159. Ashby, Eric.
The Royal Society of Tasmania, 1843-1943. 1943, p. 199. Somerville, J.
Centenary of the Royal Society of Tasmania. 1943, p. 223. Pearson, Joseph.
Some New Aspects of Tasman's Visit in 1642. 1943, p. 238. Meston, A. L.
The Life and Achievements of Charles Darwin. 1943, p. 238. Evans, J. W.
Social Life in Van Diemen's Land in the Early Days. 1943, p. 239. Collier, J. D. A.
Capt. Wm. Bligh's Discoveries in Tasmania. 1943, p. 242. MacKaness, G.
As We Were. 1943, p. 243. Hudspeth, W. H.
The Overland Journey of Sir John and Lady Franklin to Macquarie Harbour in 1842. 1943, p. 245. Smithies, F.
Some Notes on the History of the Launceston General Hospital. 1943, p. 247. Craig, C.
Early Town Planning on Hobart. 1944, p. 99. Craig, C.
Government Houses in Hobart Town. 1944, p. 109. Somerville, J.
The Early History of Salamanca Place. 1944, p. 128. Masters, W. E.

PARTLY HISTORICAL

The Evolution of Keyboard Instruments and Their Music. 1936, p. 100. Orchard, W. Arundel.
The Furniture of the 17th and 18th Centuries. 1937, p. 149. Pearson, Joseph.
The Evolution of Chair Design. 1944, p. 125. Fernyhough, F.
Aristotle, The Father of Science. 1944, p. 127. Dunbabin, A. L.

INVERTEBRATE ZOOLOGY

ANNULATA

A New Ichthyobdellid Leech and its egg-capsules. 1941, p. 41. Hickman, V. V.

ARTHROPODA

(*a*) *Crustacea*

Note on Hippomedon Kergueleni, an Amphipod Received from Cape Adare South Victoria Land. 1900-1901, p. 3. Thomson, Geo. M.
Note on Tasmanian Caprellidae. 1914, p. 75. Briggs, E. A.
Note on the Occurrence in Tasmania of the Freshwater Crab, *Hymenosoma lacustris*. 1919, p. 93. Chilton, Charles.
On the Structure of the Respiratory Organs of the Terrestrial Isopoda. 1931, p. 37. Unwin, E. E.
The Embryology of the Syncarid Crustacean, *Anaspides tasmaniae*. 1936, p. 1. Hickman, V. V.
Tasmanian Parastacidae. 1938, p. 117. Clark, Ellen.
The Grapsid and Ocypodid Crabs of Tasmania. 1941, p. 13. Tweedie, M. W. F.
The Phreatoicoidea. 1942, p. 1. Nicholls, G. E.
The Phreatoicoidea. 1943, p. 1. Nicholls, G. E.
Some Abnormal Conditions of the Reproductive System of the Saltwater Crayfish. 1944, p. 57. Hickman, V. V.

(*b*) *Insecta*

List of the Described Tasmanian Coleoptera. 1898-1899, p. li. Lea, A. M.
Notes on Some Remarkable Tasmanian Insects. *(Acrophylla tasmanienses.)* 1902, p. 81 and p. xxiv. Lea, A. M.
List of Described Coleoptera of Tasmania. 1903-1905, p. 1. Lea, A. M.
Notes on the Genus Lissotes with Descriptions of New Species. 1910, p. 346. Lea, A. M.
New Australian Asilidae (Diptera). 1913, p. 264. White, A.
The Diptera-Brachycera of Tasmania. Part I. Families Leptidae, Stratiomyidae, Nemestrinidae and Cyrtidae. 1914, p. 35. White, A.

The Diptera-Brachycera of Tasmania. Part II. 1915, p. 1. White, A.
Notes on the Genus *Pelecorhynchus*. 1915, p. 60. Hardy, G. H.
A New Gall-making Thrip. 1915, p. 102. Hardy, G. H.
A Further Exhibit of Supposed Cases of Mimicry. 1915, p. 113. Hardy, G. H.
The Diptera-Brachycera of Tasmania. Part III. 1916, p. 148. White, A.
A New Tasmanian Butterfly and a List of Known Tasmanian Species. 1916, p. 146. Hardy, G. H.
Notes on Tasmanian Diptera and Descriptions of New Species. 1916, p. 267. Hardy, G. H.
Notes on Tasmanian Diptera and Descriptions of New Species. 1917, p. 60. Hardy, G. H.
Notes on Tasmanian Butterflies. 1917, p. 67. Hardy, G. H.
Tasmanian Cicadidae. 1917, p. 69. Hardy, G. H.
New Australian Asilidae. 1917, p. 72. White, A.
Australian Rhyphidae and Leptidae (Diptera). 1919, p. 117. Hardy, G. H.
Australian Stratiomyidae. 1920, p. 33. Hardy, G. H.
Australian Bombyliidae and Cyrtidae. 1921, p. 41. Hardy, G. H.
Notes on Australian Bombyliidae Mostly from the Manuscript of the late Arthur White. 1923, p. 72. Hardy, G. H.
Australian Dixidae (Diptera). 1923, p. 58. Tonnoir, A. L.
New and Little-known Tasmanian Lepidoptera. 1925, p. 81. Turner, A. Jeffries.
New and Little-known Tasmanian Lepidoptera. 1926, p. 119. Turner, A. Jeffries.
A Revision of the Lepidoptera of Tasmania. 1925, p. 118. 1927, p. 27. Turner, A. Jeffries.
The Evolution of the Class Insecta. 1930, p. 1. Tillyard, R. J.
Tasmanian Collembola of the Family Sminthuridae (Globular Springtails). 1931, p. 1. Worsley, H.
The Trout-Food Insects of Tasmania. Part I. A Study of the Genotype of the Mayfly Genus *Atalophlebia* and Its Life History. 1933, p. 1. Tillyard, R. J.
A Contribution to the Study of Tasmanian Copeognatha. 1933, p. 77. Hickman, V. V.
The Trout-Food Insects of Tasmania. Part II. A Monograph of the Mayflies of Tasmania. 1935, p. 23. Tillyard, R. J.
The Bythoscopidea of Australia. (Homoptera, Jassoidea.) 1935, p. 61. Evans, J. W.
Australian Leaf-Hoppers (Homoptera, Jassoidea). Part 4. Ledridae, Ulopidae and Euscelidae, Paradorydiini. 1936, p. 37. Evans, J. W.
Australian Leaf-Hoppers. (Homoptera, Jassoidea). Part 5. Euscelidae (in part). 1936, p. 51. Evans, J. W.
A Contribution to the Study of Jassoidea (Homoptera). 1938, p. 19. Evans, J. W.
Australian Leaf-Hoppers. (Homoptera Jassoidea). Part 8. 1938, p. 1. Evans, J. W.
A Second Revision of the Lepidoptera of Tasmania. 1938, p. 57. Turner, A. Jeffries.
New Leaf-Hoppers from Tasmania and Queensland. 1941, p. 27. Evans, J. W.
The Morphology of the Head of Homoptera. 1937, p. 1. Evans, J. W.
The Morphology of *Tettigarcta tomentosa* White. (Homoptera, Cicadidae). 1940, p. 35. Evans, J. W.
The Phylogeny of the Homoptera. 1941, p. 37. Evans, J. W.
A Mecopterous Larva from Tasmania and Notes on the Morphology of the Insect Head. 1941, p. 31. Evans, J. W.
The Scope of Applied Entomology. 1936, p. 99. Evans, J. W.
Forest Entomology (Abstract). 1937, p. 154. Evans, J. W.
Notes on the Systematics of Two Species of Heterodoxus (Mallophaga, Boopidae). 1939, p. 19. Plomley, N. J. B.
The Distribution of *Heterodoxus spiniger* (Enderlein). 1939, p. 27. Thompson, G. B.
A New Genus of Mecoptera from Tasmania. 1940, p. 51. Carpenter, F. M.
Recent Progress on Entomology in Tasmania. 1941, p. 77. Evans, J. W.

(*c*) *Arachnida*

On a *Pycnogonid* of the Genus *Halosoma*. 1918, p. 11. Flynn, T. Thomson.
Two New Australian *Pycnogonida*. 1918, p. 91. Flynn, T. Thomson.
A Re-examination of Professor Haswell's types of Austalian *Pycnogonida*. 1919, p. 70. Flynn, T. Thomson.
Notes on Tasmanian *Araneidae*, with a description of new species. 1925, p. 171. Hickman, V. V.
Studies in Tasmanian Spiders. Part I. 1926, p. 52. Hickman, V. V.
Studies in Tasmanian Spiders. Part II. 1927, p. 158. Hickman, V. V.
Studies in Tasmanian Spiders. Part III. 1928, p. 96. Hickman, V. V.
Studies in Tasmanian Spiders. Part IV. 1929, p. 87. Hickman, V. V.
Studies in Tasmanian Spiders. Part V. 1931, p. 20. Hickman, V. V.
A New Mygalomorph Spider belonging to the Genus *Hexathele* Ausserer. 1935, p. 131. Hickman, V. V.
The Toxopidae, A New Family of Spiders. 1939, p. 125. Hickman, V. V.
On Some New Hadrotarsidae (Araneae) with Notes on Their Internal Anatomy. 1942, p. 147. Hickman, V. V.
On Some New Australian Apneumonomorphae with Notes on Their Respiratory System. 1943, p. 179. Hickman, V. V.

COELENTERATA
Two Hydromedusoid Records for Tasmania. 1926, p. 91. Flynn, T. Thomson.
Notes on Coral Reefs with special reference to the Funafuti Bore. 1898-1899, p. 92. Stephens Thos.
An Astraeid Coral from Dover. 1939, p. 136. Pearson, Joseph.

MOLLUSCA
List of Tasmanian Shells in the Tasmanian Museum. 1898-1899, p. 129. Lodder, M.
On Some Land and Aquatic Shells from Maria Island. 1900-1901, p. 1. Petterd, W. F.
The Recent Mollusca of Tasmania. 1900-1901, p. 102. Lodder, M.
Notes on Tasmanian Conchology. 1902, p. 77. Hedley, C.
On Tenison-Woods Types in the Tasmanian Museum, Hobart. 1902, p. 106. May, W. L.
Additions to the Tasmanian Molluscan Fauna. 1908, p. 53. May, W. L.
Additions to the Catalogue of the Marine Shells of Tasmania. 1910, p. 306. May, W. L.
New Marine Mollusca. 1910, p. 380. May, W. L.
New Marine Mollusca. 1910, p. xvi. May, W. L.
A New Tasmanian Chiton. 1912, p. 1. Torr, W. G.
Polyplacophora of Tasmania. 1912, p. 25. May, W. L. and Torr, W. G.
Further Additions to the Tasmanian Mollusca. 1912, p. 41. May, W. L.
List of Tenison-Woods Types of Recent Mollusca in the Tasmanian Museum. 1915, p. 61. Hardy, G. H.
Additions to the Tasmanian Marine Mollusca, with description of new species. 1915, p. 75. May, W. L.
New Names for Tasmanian Marginellas. 1917, p. 104. May, W. L.
A Revised Census of the Mollusca and Brachiopods in the Table Cape Beds. 1918, p. 101. May, W. L.
Additions to the Catalogue of the Tasmanian Mollusca. 1929, p. 33. Robin, P. Ansell.
New Species of Tasmanian Mollusca, with Critical remarks on several described species and additions to the list. 1919, p. 55. May, W. L.
A Revised Census of the Tasmanian Fluviatile Mollusca. 1920, p. 65. May, W. L.
Mollusca of King Island. 1923, p. 47. May, W. L.
Notes on, and Additions to, the Chiton Fauna of the North-West Tasmania, together with a brief review of the Genus *Stenochiton*. 1926, p. 92. Ashby, Edwin.

MOLLUSCOIDA
On the Genus *Kraussina* in Tasmania. (Plates.) 1898-1899, p. 88. Twelvetrees, W. H. and Petterd, W. F.
Some Australian Brachiopods. 1913, p. 112. Blochmann, F.
The Occurrence of the Freshwater Polyzoan, *Plumatella repens* (Van Beden) in Tasmania. 1932, p. 7. Hickman, V. V. and Scott, E. O. G.

PLATYHELMINTHES
New Trematodes from Tasmanian Fishes. 1944, p. 61. Crowcroft, P. W.

PORIFERA
On a Freshwater Sponge from Tasmania. 1922, p. 58. Flynn, T. Thomson.

PROTOZOA
A New Protozoan Parasite from a Bdellid Mite. 1932, p. 10. Bourne, G.

GENERAL
The Cryptozoic Fauna of Mt. Wellington. 1935, p. 199. Hickman, V. V.

MEDICINE AND PUBLIC HEALTH

Cause and Prevention of Typhoid Fever, with special reference to the Proposed Metropolitan Drainage Scheme of Hobart. 1898-1899, p. ix. Sprott, Gregory.
Typhoid in Hobart and Melbourne and the influence of drainage on its prevalence. 1902, p. xxxiii. p. 95. Jamieson, James.
Sewage Purification and Disposal. 1902, p. xxxiii. p. 100. Wilkinson, Edwin H.
Some Social and Economic Aspects of Public Health Work. 1903-1905. Elkington, J. S. C.
Insects and Diseases. 1903-1905, p. 113. Elkington, J. S. C.
The Biological Ancestry of Some Human Diseases. 1906-1907, p. vii. Smith, Gerald.
School Hygiene. 1906-1907, p. ix. Elkington, J. S. C.
The Germ as a Friend in Therapeutics. (The Opsonic Index.) 1906-1907, p. xli. Roberts, Edw. J.
Skin Diseases treated by blood vaccine. 1910, p. 371. Ireland, E. W. J.
Australian Fauna and Medical Science. 1925, p. 203. Mackenzie, Wm. Colin.
Inheritance of Visual Defects. 1939, p. 138. Hamilton, J. Bruce and Pearson, Joseph.
A Short History of the Application of Rays in Medicine. 1939, p. 141. Holman, N. P.
Eugenics: The Medical Aspect. 1941, p. 78. Brothers, C. R.
Human Blood Groups. 1944, p. 124. Duncan, C.

METEOROLOGY AND ASTRONOMY

Lightning Flashes. 1898-1899, p. xxxvii. Aikenhead, Wm.
Magnetic Survey of Tasmania. 1900-1901, p. iv. p. 85. Hogg, E. G.
The Observatory. 1902, p. xi. Kingsmill, H. G.
Hobart Observatory and its Work 1902, p. xx.
Temperature at Great Lake. 1902, p. xxv. p. xxvii. Archer, F. H.
Practical Astronomy in Tasmania. 1902, p. 85. McAulay, Alex.
Federal Meteorology. 1903-1905, p. xxxvii. Kingsmill, H. C.
Rainfall and Water Supply of the Great Lake. 1903-1905, p. x. Kingsmill, H. C. and Legge, W. V.
On Solar Eclipses. 1908, p. xi. Kingsmill, H. C.
Notes taken at Bellerive at the time of the recent eclipse of the sun. 1910, p. iv. Green, A. O.
The Completion of the General Magnetic Survey of Australia by the Carnegie Institution of Washington, 1921, p. 84. Kidston, Capt. Edward.

MISCELLANEOUS

Reservoirs. 1900-1901, p. x. Targett, C. B.
Tasmanian Museum and Art Gallery Extension. 1900-1901, p. xxxix.
Valuable Works of Art. 1900-1901, p. xi. Simpkinson de Wesselow, F. G.
New Additions to the Tasmanian Museum and Art Gallery. 1902, p. vii.
Reservation of land at Schouten and Freycinet Peninsula. 1903-1905, p. xxxi. Mather, J. R.
The Decimal System, as applied to Weights, Measures, and Money. 1903-1905, p. xx. Mercer, E. J.
A New Range Finder. 1903-1905, p. lxi. Kingsmill, H. C.
Stereoscope Photography. 1903-1905, p. lxii. Masters, W. E.
Army Signalling. 1903-1905, p. li. Hayter, F. T.
Tasmanian Relics in the Havre Museum. 1914, p. 81. Hedley, Charles.
The Italian Foundations of Painting from Michelangelo to Giotto. 1937, p. 151. Counsel, J. M.
Art in a Changing World. 1937, p. 151. Lismer, A.
Shakespeare and Music. 1938, p. 237. Orchard, W. A.
A Five-Rupee Gold Coin of the East India Coy. 1939, p. 40. Butler, W. F. D.
Modern Museum Display Methods. 1941, p. 84. Boswell, R.
Colour Photography in Tasmania. 1939, p. 141. King, H. J.
Lightning and other Natural Phenomena. 1939, p. 141. Ingles, J. A.
Modern Museum Developments. 1939, p. 142. Scott, E. O. G.
Colour Photography. 1940, p. 88. King, H. J.
A Play in Five Acts—by Sacha Guitry. 1941, p. 79. Triebel, L. A.
Some Aspects of the Development of the Eucalyptus Pulping Industry and the Manufacture of Newsprint. 1941, p. 83.
Some Aspects of Music. 1941, p. 77. Nicholls, J. W.
A Naturalist in Tasmania. 1941, p. 86. Scott, E. O. G.
Infinity and the Greek Mind. 1943, p. 239. Elliott, J. R.
Cine Biology. 1943, p. 245. King, H. J.

OBITUARY AND BIOGRAPHICAL

Unveiling a Portrait of Sir James Agnew. 1898-1899, p. xxxviii.
Mr. James Barnard. 1898-1899, p. xlv.
Sir James Agnew. 1898-1899, p. lvi.
Mr. J. B. Walker, F.R.G.S. 1898-1899, p. lix.
The Bishop of Tasmania 1900-1901, p. xxxiv.
Alex Morton. 1906-1907, p. xlvii.
Frank Allwork. The Reverend George Clark. Sir John George Davies. Thomas Stephens. Russell Young. 1913, p. 313.
The Hon. G. H. Butler, Lieut.-Colonel Richard Charles Lewis. The Hon. James Macfarlane. Arthur Augustus Stephens. Alexander George Webster. 1914, p. 104.
George Watkins Smith. 1916, p. 286. Rodway, L.
Arthur White. 1917, p. 128.
R. M. Johnston. Colonel W. V. Legge. Augustus Simson. Sir Henry Dobson. 1918, pp. 136, 142, 143.
W. H. Twelvetrees. 1919, p. 165.
Presentation of Royal Society Medal to L. Rodway. 1928, p. 163.
Notes on a Memorial to Alfred Barrett Biggs, Astronomer. 1933, p. 26. Meston, A. L.
Clive Errol Lord. 1933, p. 98. Reynolds, John.
Leonard Rodway. 1936, p. 94.
Lewis, A. N. 1943, p. 248. Crowther, W. E. L. H.
Unwin, E. E. 1944, p. 133. Hickman, V. V.

PHYSICS, CHEMISTRY, &c.

On the Relation between the Loss of Energy and the Ionisation produced by Cathode Rays 1913, p. 1. Glasson, J. L.
Quaternions applied to Physics in Non-Euclidean Space—The Mathematical Methods. 1914, p. 1. McAulay, Alex.
An Experimental Method of presenting the Principles determining the General Properties of Optical Gratings. 1923, p. 87. McAulay, A. L.
The Penetrating Radiation in the Atmosphere at Hobart. 1924, p. 123. McAulay, A. L. and Hutchison, Miss N. L.
Researches in Relativity. I. Criticism and Modification of Einstein's Latest Manifold. 1924, Appendix. McAulay, A. L.
Researches in Relativity. II. The basis of the Physical World as indicated by carrying as far as possible the Tenets of Relativity. 1925, Appendix. McAulay, A. L.
An Original and Independent Method of Extracting Roots and Numbers. 1928, p. 160. Blackman, A. E.
A Study of the Carbonization of some Tasmanian Timbers. 1941, p. 63. Jaeger, J. C. and Johnston, Cynthia M.
Charcoal: Its Properties and Production. 1942, p. 167. Jaeger, J. C.
Some Avenues of Chemical Research in Tasmania. 1944, p. 123. Israel, G. C., Kurth, E. E. and Ralph, B. J.

VERTEBRATE ZOOLOGY

Amphibia

Tasmanian Amphibia in the Museum of Comparative Zoology, Cambridge, Massachusetts. 1933, p. 56. Loveridge, A.

Aves

Notes on Further Regulations in Reference to the Mutton Bird Industry. 1898-1899, p. xv. Montgomery, H. H.
Egg of a Pallid Cuckoo in Nest of Goldfinch. 1900-1901, p. xiii. Harrison, M.
Note on the Birds of Tasmania. 1900-1901, p. 90. Legge, R. W.
Birds of North Great Lake. 1902, p. xxvii. Archer, F. H.
Notes on Certain Birds met with by Crozet, one of the very early Navigators. 1903-1905, p. xlviii. McClymont, J. R.
The Tasmanian Emu. 1906, p. xi. Legge, R. W.
Tasmanian Emu. 1907, p. xlvi. Morton, Mrs. C. E.
Habits of Mutton Birds. 1908, p. vii. Baker, H.
Points on the Anatomy of Certain Megapodes. 1909, p. 175. Flynn, T. T.
Russian Fauna. 1908, p. ii. (Account of Travels.) Hall, R.
The Distribution of Australian Land Birds. 1910, p. ix (Abstract) and p. 134 (Paper). Hall, R.
The Feather-Tracts of *Sphenura broadbenti* McCoy. 1911, p. xi (Abstract) and p. 33 (Paper). Hall, R.
Note on *Trachinops taeniatus*. 1911, p. xix and p. 32. Hall, R.
On the connection of Swifts with Weather. 1911, pp. xix and 99. Dove, H. Stuart.
Migratory Birds. 1912, p. xvii. Hall, R.
English Blackbird Nesting in Tasmania 1919, p. 155. Lord, Clive.
A Note on the King Island Emu. 1923, p. 103. Scott, H. H.
The Extinct Tasmanian Emu. 1931, p. 108. Scott, H. H.
The Life of the Lyre Bird. 1941, p. 79. Sharland, M. S. R.

Mammalia

Notes on the Marsupialian Anatomy 1. On the Conditions of the Medium Septum in the Trichosuridae. 1911, p. 120. Flynn, T. T.
Notes on Marsupial Anatomy: On the Female Genital Organs of a virgin *Sarcophilus satanicus*. 1911, p. 144. Flynn, T. T.
Notes on the Mammals of Tasmania. 1918, p. 16. Lord, Clive.
Studies of Tasmanian Cetacea. Part I. *(Orca gladiator, Pseudorca crassidens, Globicephalus melas)*. 1919, p. 1. Lord, Clive and Scott, H. H.
Studies of Tasmanian Cetacea. Part II. *(Ziphius cavirostris.)* 1919, p. 23. Lord, Clive and Scott, H. H.
Studies of Tasmanian Cetacea. Part III. *(Tursiops tursio.)* 1919, p. 96. Lord, Clive and Scott, H. H.
Studies of Tasmanian Cetacea. Part IV. *(Delphinus delphis.)* 1920, p. 1. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals. Living and Extinct. Number 1. *Nothotherium mitchelli*. 1920, p. 13. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number II. 1920, p. 17. Lord, Clive, and Scott, H. H.

Studies in Tasmanian Mammals, Living and Extinct. Number III. *Nothotherium mitchelli.* 1920, p. 76. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number IV. *Nothotherium mitchelli.* 1920, p. 97. Lord, Clive and Scott, H. H.
Nothotheria and Allied Animals. 1921, p. 1. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number IV. The Cave Deposits at Mole Creek. 1921, p. 6. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number V. *Zaglossus harrissoni.* Sp. nov. 1921, p. 13. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number VI. Cetacean Remains from the Fossil Beds at Wynyard. 1921, p. 180. Lord, Clive and Scott, H. H.
Skeletons of the Monotremes in the Collections of the Army Medical Museum at Washington. 1921, p. 99. Shufeldt, R. W.
Studies in Tasmanian Mammals, Living and Extinct. Number VII. A Note on the Turbinoid Cells and Allied Data of *Nothotherium mitchelli.* 1922, p. 23. Lord, Clive and Scott, H. H.
On the Tasmanian Muridae. 1922, p. 74. Lord, Clive and Scott, H. H.
On *Pseudomys higginsi.* 1922, p. 55. Lord, Clive.
Studies in Tasmanian Mammals, Living and Extinct. Number VIII. Pleistocene Marsupials from King Island. 1923, p. 1. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number IX. *Nothotheria victoriae.* Owen. 1923, p. 4. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number X. Giant Wallaby. *Macropus anak.* Owen. 1923, p. 6. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number XI. Notes on a Mutilated Femur of Nothotherium. 1923, p. 56. Lord, Clive and Scott, H. H.
Earbones of the Nothotheria and Allied Animals. 1924, p. 1. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number XII. On Certain Tasmanian Pleistocene Marsupials. 1924, p. 53. Lord, Clive and Scott, H. H.
Tasmanian Giant Marsupials. 1925, p. 1. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number XIII. The Eared Seals of Tasmania. 1925, p. 75. Lord, Clive and Scott, H. H.
Studies in Tasmanian Mammals, Living and Extinct. Number XIV. The Eared Seals of Tasmania (Part II.). 1925, p. 187. Lord, Clive and Scott, H. H.
Studies in Tasmanian Cetacea. Part V. *Mesoplodon layardi* Gray. 1926, p. 87. Lord, Clive and Scott, H. H.
Studies in Tasmanian Cetacea. Part VI. 1927, p. 156. Lord, Clive, and Scott, H. H.
The R. M. Johnston Memorial Lecture, 1925. The Mammalian Toilet and Some Considerations arising from it. 1925, p. 14. Jones, F. Wood.
Notes on the Sea Elephant *(Mirounga leoninus).* 1928, p. 93. Lord, Clive and Scott, H. H.
Existing Tasmanian Marsupials. 1927, p. 17. Lord, Clive.
Occurrence of Sea Elephant at Dunalley. 1933, p. 91. Lord, Clive.
The Whales and Dolphins of Tasmania. Part I. External Characters and Habits. 1935, p. 163. Pearson, Joseph.
The Tasmanian Brush Opossum: Its Distribution and Colour Variations. 1937, p. 21. Pearson, Joseph.
Notes on the Blood System of the Marsupialia. 1939, p. 77. Pearson, Joseph.
The Female Urogenital System of the Marsupialia with Special Reference to the Vaginal Complex. 1944, p. 71. Pearson, Joseph.

PISCES

Visit to British Columbia to obtain Salmon Ova. 1900-1901, p. xxxvi. (Report). Morton, Alex.
Spawning of Fish at Great Lake. 1902, p. xxx. Archer, E. H.
Notes on a New Tasmanian Fish. 1902, p. vi. Johnston, R. M.
A New Fish. 1902, p. x. Johnston, R. M.
Rainbow Trout from Lake Dulverton. 1903-1905, p. lxi. Morton, Alex.
Some Notes on the Propogation of the Cucumber Herring. 1906-1907, p. xi. Harrison, C. H.
South-Eastern Australian Mackerel, *Scomber antarcticus.* 1910, p. iv. Johnston, R. M.
Notes on Derwent Estuary Fishes. 1912, p. 79. Hall, R.
A List of the Fishes of Tasmania. 1922, p. 60. Lord, Clive.
Vinculum sexfasciatum Richardson. An Addition to the Fish Fauna of Tasmania. 1923, p. 43. Lord, Clive.
Additions to the Fish Fauna of Tasmania. 1924, p. 51. Lord, Clive.
R. M. Johnston's Memoranda relating to the Fishes of Tasmania. 1928, p. 44. Whitley, G. P.
Observations on Some Tasmanian Fishes, with Descriptions of New Species. 1933, p. 31. Scott, E. O. G.
Observations on Some Tasmanian Fishes. Part II. 1934, p. 63. Scott, E. O. G.
Observations on Some Tasmanian Fishes. Part III. 1935, p. 113. Scott, E. O. G.
Observations on Some Tasmanian Fishes. Part IV. 1938, p. 139. Scott, E. O. G.

Observations on Some Tasmanian Fishes. Part V. 1941, p. 45. Scott, E. O. G.
Notes on the Gobies Recorded from Tasmania with Description of a New Genus. 1934, p. 47. Scott, E. O. G.
On a New Genus of Fishes of the Family Galaxiidae. 1934, p. 41. Scott, E. O. G.
Some Aspects of the Study of Tasmanian Fishes. 1935, p. 197 (Abstract of Lecture). Scott, E. O. G.
Observations on Fishes of the Family Galaxiidae. Part I. 1935, p. 85. Scott, E. O. G.
Observations on Fishes of the Family Galaxiidae. Part II. 1937, p. 111. Scott, E. O. G.
Observations on Fishes of the Family Galaxiidae. Part III. 1940, p. 55. Scott, E. O. G.
Geotria australis, Gray. 1939, p. 135. Hickman, V. V.
Fish and Fish-like Animals. 1940, p. 81. Scott, E. O. G.
Recent Researches on Fishes. 1940, p. 86. Scott, E. O. G.
Sharks. 1942, p. 166. Whitley, G. P.
Developing Our Fisheries. 1944, p. 124. Blackburn, M.

REPTILIA

On the Occurrence of a Sea Snake in Tasmanian Waters. 1898-1899, p. iv. Morton, Alex.
Notes on the Snakes of Tasmania. 1918, p. 76. Lord, Clive.
Occurrence in Tasmania of *Hydrus platurus* Linn. 1919, p. 22. Lord, Clive.
Occurrence in Tasmania of *Hydrophis ornatus*, variety *ocellatus*, with a note on *Pelamis platurus* (= *Hydrus platurus*). 1931, p. 111. Scott, E. O. G.
The So-called Minute Snake of Tasmania. 1933, p. 54. Scott, E. O. G.

H. H. Pimblett, Government Printer, Tasmania.

B1533